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PANICUM IN NICARAGUA

Frank C. Seymour[1]

Recent collections in Nicaragua having added several species to the number previously known to occur there, a report of these additions is here presented. At the same time, citations are given of the specimens on which these and other reports of Panicum in Nicaragua are based.

Since the comprehensive treatment by Hitchcock in The Grasses of Central America in 1922, more recent papers by Swallen in Gramineae of Panama in 1943 and Grasses of Guatemala in 1955, have added a number of new species to those known in Central America. Species known in some other part of Central America may at any time be found in Nicaragua. In the hope of extending the known ranges of such species, they have been included in the following pages, --the key for identification and briefly in the annotated list. While primarily concerned with Nicaragua, this treatment serves for other parts of Central America, also.

My thanks are expressed to the following persons and institutions for the privilege of examining specimens in their herbaria. Dr. Reed C. Rollins, Director of the Gray Herbarium. Dr. Richard A. Howard, Director of the Arnold Arboretum. Dr. Daniel B. Ward, Director of the Herbarium of the University of Florida. Dr. Willard W. Payne, Chairman of the Department of Botany of the University of Florida. Dr. Lyman B. Smith and Dr. David B. Lellinger of the United States National Herbarium.

The genus Panicum L. in the subfamily Panicoideae may be described briefly as follows. Spikelets in racemes or more often in panicles. Glumes herbaceous, the lower (outer) one shorter than the upper (inner) one. The upper glume about equal to the sterile lemma. Fertile lemma and palea hardened (indurated), nerveless. the lemma inrolled over the palea. Herbaceous annuals or perennials.

[1]Research Associate, Missouri Botanical Garden, and Visiting Associate Research Professor, University of Florida.

As it is often difficult or impossible to tell whether lower leaves are different or similar to upper leaves, because the lower leaves may have fallen, that character, while fundamental for classification in this genus and very useful when observable, has been subordinated in the following key.

Blades described in the following pages are longest blades, unless otherwise stated. There is often wide variation in size on the same stem.

ARTIFICIAL KEY TO SPECIES OF PANICUM
known to occur in Central America.

A. Longest blades (and usually others) 21-60 times as long as wide B. cp. p. 4
 B. Spikelets hairy C.
  C. Spikelets 2.1-2.5 mm long; blades 23-24 times as long as wide, 3-5 mm wide, 7-12 cm long; lower sheaths villous; panicles 4-6 cm long 70. P. arenicoloides Ashe
  C. Spikelets 3-3.5 mm long; blades 30-40 times as long as wide D.
   D. Blades 5-10 mm wide, 15-40 cm long; sheaths papillose-hispid; spikelets sparsely hirsute . . . . .62. P. Rudgei R. & S.
   D. Blades 2-4 mm wide, 6-15 cm long; upper sheaths glabrous, lower sheaths hairy; spikelets papillose-villous . . . . 69. P. fusiforme Hitchc.
 B. Spikelets glabrous, at least in primary panicles E.
  E. Sheaths compressed, keeled; lower glume about 1/2 as long as spikelet; sheaths glabrous F.
   F. Blades 5-12 mm wide, 20-50 cm long; sheaths longer than internodes; spikelets 1.8-2.2 mm long . . . . 26. P. rigidulum Nees
   F. Blades 1-5 mm wide, 5-15 cm long; sheaths shorter than internodes; spikelets 2.2-2.4 mm long; sterile palea enlarged, swelling spikelet 27. P. hians Ell.
  E. Sheaths neither compressed nor keeled G.
   G. Spikelets 1.4-1.6 mm long; panicle very narrow, few-flowered, 1-2 cm long; blades 2-4 mm wide or less, 4-15 cm long, usually with turned under (revolute) margins, then 0.3-0.5 mm wide; upper sheaths glabrous . . . . . 36. P. stenodes Griseb.
   G. Spikelets 2-6 mm long H.
    H. Fruit transversely wrinkled or ridged I.
     I. Spikelets on 1 side of branches, 2-3 mm long; pedicels short; stems tufted, decumbent at base; blades 10-40 cm long J.

J. Spikelets 2-2.5 mm long; nodes glabrous; glumes and sterile lemma not papery . . . . 1. P. geminatum Forsk.

J. Spikelets 2.8-3 mm long; glumes and sterile lemma papery . . . . 2. P. paludivagum H. & C.

I. Spikelets not on 1 side of branches K.

K. Spikelets 2.2-2.5 mm long; panicles open, 7-12 cm long, branches stiffly ascending, naked at base; longest blades 8-25 cm long; rootstocks extensively creeping . . . . 31. P. repens L.

K. Spikelets 3-4.2 mm long; stem 1-2.5 m long; longer blades 25-60 cm long or longer L.

L. Stems from short stout rootstocks; spikelets 3 mm long; blades 10-20 mm wide . 24. P. maximum Jacq.

L. Stems from corm-like base; spikelets 3.5-5 mm long M.

M. Sheaths glabrous; stems leafy; blades 3-12 mm wide; spikelets 3.5-4.2 mm long . . . . 28. P. bulbosum HBK.

M. Sheaths densely papillose-pilose; stem almost leafless; blades 3-5 mm wide; spikelets 4.5-5 mm long; fruit minutely ridged . . . . 29. P. paucifolium Swallen

H. Fruit not ridged; spikelets 3-6 mm long N.

N. Spikelets 5-6 mm long; blades 2-8 mm wide, 10-30 cm long, 40-50 times as long as wide, margins ciliate; lower glume 1/2 as long as spikelet; annual . . . . 103. P. parcum H. & C.

N. Spikelets 2-5 mm long O.

O. Upper (and other) sheaths hairy, not only on or near margins P.

P. Spikelets 4-4.2 mm long; blades 5-10 mm wide, 7-30 cm long; perennial . . . . 21. P. lepidulum H. & C.

P. Spikelets 2-3.2 mm long, glabrous; lower glume acute Q.

Q. Spikelets 2-2.2 mm long R.

R. Panicles 8-20 cm long; blades 5-8 mm wide, 12-20 cm long; annual . . . . 18. P. cayennense Lam.

R. Panicles 1 cm long; blades 1-2 mm wide, 3-8 cm long . . . . .35. P. stenodoides F. T. Hubb.

Q. Spikelets 2.5-3.3 mm long S.

S. Panicles 20-30 cm long; blades 3-5(-12) mm wide, 13-17 cm long; perennial . . . . 22. P. Ghiesbreghtii Fourn.

S. Panicles 5-15 cm long; blades 4-10 mm wide, 8-25 cm long; annual . . 10. P. hirticaule Presl

O. Upper sheaths glabrous except sometimes on or near margins; perennial T.

T. Stem fleshy, often 2 cm thick; spikelets 4-5 mm long; lower glume 1/4 as long as spikelet; blades elongate . . . . 9. P. elephantipes Nees

T. Stem not fleshy, thinner; spikelets 2.2-5 mm long U.

U. Spikelets 2.2-2.8 mm long; lower glume 1/2 as long as spikelet; panicles very narrow, few-flowered, 3-8 cm long; blades 2-4 mm wide, 4-15 cm long; rootstock not creeping 25. P. tenerum Beyr.

U. Spikelets 3-5 mm long; lower glume 2/3 to 3/4 as long as spikelet; panicles wider, many-flowered, 20-40 cm long; stem 1.5-4 m long V.

V. Blades 15-20 mm wide, 40-70 cm long, glabrous, margins rough 30. P. Lundellii Swallen

V. Blades 8-15 mm wide, 30-45 cm long W.

W. Rootstock not creeping; spikelets 3.5-4.2 mm long; blades sometimes villous at base, scabrous above . . . 32. P. ichnanthoides Fourn.

W. Rootstock creeping; blades glabrous above and beneath or pilose near base X.

X. Panicle lax, slightly drooping, branches spreading; spikelets 3-4 mm long, few within 2 cm of main axis . . . . 33. P. altum H. & C.

X. Panicle stiffly ascending; spikelets 3.5-5 mm long, some usually near main axis . . . .34. Switch-Grass, P. virgatum L.

A. Longest blades (and usually others) 2-20 times as long as wide Y. cp. p. 2

Y. Spikelets large, 3-6 mm long Z. cp. p. 6

Z. Spikelets or fruit hairy a.

a. Stem hairy; spikelets 3.5-4 mm long; blades hairy above and beneath b.

b. Fruit finely transversely wrinkled; spikelets densely hairy; nodes bearded; blades 6-20 mm wide, 5-25 cm long; axis with conspicuous spreading hairs; annual . . . . 6. P. molle Sw.

b. Fruit not wrinkled; spikelets papillose-hairy; nodes not bearded; blades 6-14 mm wide, 5-12 cm long; perennial . . 89. P. transiens Swallen

a. Stem glabrous c.

c. Blades pilose above and beneath; sterile lemma bearing 1 gland on each side of midnerve; spikelets 3.6 mm long, sparsely hispid . . . . .47. P. biglandulare Scribner & Smith

c. Blades glabrous except sometimes ciliate margins; sterile lemma without glands; spikelets 3 mm long, glabrous or sparsely hairy; panicle 5-8 cm long; blades 10-15 mm wide, 6-12 cm long; cp. p. 14 . . . . 87. P. Joorii Vasey

Z. Spikelets and fruit glabrous d.

d. Spikelets 4-6 mm long e.

e. Spikelets 5.5-6 mm long; blades 8-30 mm wide, 4-15 cm long, 5 times as long as wide, margins very harsh; lower glume 2/3 as long as spikelet; perennial . . . . 102. P. zizanioides HBK.

e. Spikelets 4-4.5 mm long; blades 4-10 mm wide, 10-30 times as long as wide f.

f. Spikelets, some in lower half of panicle; terminal panicle 6-15 cm long, its branches solitary, stiffly ascending; lower glume usually more than 3/4 as long as spikelet; blades 5-12 cm long, 10-12 times as long as wide . . . . 11. P. pampinosum H. & C.

f. Spikelets few, borne near ends of branches; terminal panicle up to 20 cm long; lower glume about 1/2 as long as spikelet; blades 7-30 cm long, 14-30 times as long as wide . . . . 21. P. lepidulum H. & C.

d. Spikelets 3-3.6 mm long g.

g. Larger blades 15-30 mm wide; panicles 15-30 cm long h.

h. Lower glume obscure or at most 1/5 to 1/6 as long as spikelet; stem glabrous; nodes hairy . . . . 99. P. Tuerckheimii Hackel

h. Lower glume 1/3 to nearly as long as spikelet; spikelets 3-3.5 mm long, i.

i. Lower and upper glumes blunt, nearly as long as spikelet; sheaths glabrous or pilose; spikelets 3-3.5 mm long . . . . 61. P. glutinosum Sw.

i. Lower glume 1/4 to 1/2 as long as spikelet; sheaths mostly papillose-hispid j.

j. Panicle stiffly ascending, 23 cm long; lower glume 1/4 to 1/3 as long as spikelet; perennial . . . . 63. P. Mertensii Roth

j. Panicle drooping; nodes hairy; blades clasping stem; lower glume 1/3 to1/2 as long as spikelet; annual . . . . 17. P. sonorum Beal

g. Larger blades (2-)4-10(-15) mm wide k.

k. Sheaths glabrous; blades 5-10 mm wide l.

l. Blades papillose-pilose or villous above, 8-10 cm long; spikelets 3.5 mm long; panicle 5-8 cm long . . . . 20. P. sublaeve Swallen

l. Blades glabrous, 5-12(-17) cm long; spikelets 3 mm long; panicle 10 cm long . . . . 8. P. aquaticum Poiret

k. Sheaths hairy or merely papillose without hairs m.

m. Stems creeping at base; blades 5-10 mm wide; sheaths papillose or papillose-pilose; perennial n.

n. Blades 10-25 cm long; spikelets glabrous; panicles 10-20 cm long 3. P. purpurascens Raddi

n. Blades 5-10 cm long; spikelets in primary panicles usually glabrous, those in secondary panicles usually papillose-villous; primary panicles 10-15 cm long 90. P. cordovense Fourn.

m. Stems not creeping at base; panicles 20-30 cm long; blades 3-13 mm wide, 13-30 cm long; ligule 1.5-3 mm long o.

o. Sheaths, stems and blades papillose-hispid; spikelets 3.5-3.6 mm long; blades 8-13 mm wide, 15-30 cm long; annual . . . . 19. P. hispidifolium Swallen

o. Sheaths, nodes, and blades hirsute; spikelets 2.7-3.2 mm long; longest blades 3-5(-12) mm wide, 13-17 cm long; perennial . . . . 22. P. Ghiesbreghtii Fourn.

Y. Spikelets smaller, 1-3 mm long p. cp. p. 4

p. Spikelets (1-)1.3-1.9(-2) mm long; sheaths slightly hairy to glabrous or hairy only on margins q. cp. p. 11

q. Spikelets or fruit hairy, sometimes only slighty hairy r. cp. p. 8

r. Ligule (2-)3-5 mm long; spikelets 1.2-2 mm long; larger blades (2-)4-8 mm wide, (3-)4-8 cm long; blades hairy or at least puberulent beneath s.

s. Spikelets 1-1.2 mm long; blades minutely hairy beneath t.

t. Spikelets 1 mm long 74. P. Wrightianum Scribner

t. Spikelets 1.2 mm long 73. P. longiligulatum Nash

s. Spikelets 1.6-2 mm long; blades hairy on both surfaces; sheaths mostly shorter than internodes; nodes usually bearded u.

u. Spikelets sparsely hairy or nearly glabrous; upper glumes and sterile lemma slightly surpassing fruit; upper blades (and others) 9-13 mm wide, 5-13 cm long; basal blades similar to upper blades . . . . 86. P. viscidellum Scribner

u. Spikelets abundantly hairy; upper glume and sterile lemma scarcely equaling fruit; upper blades 5-10 mm wide, 4-10 cm long; axis of panicle pilose; basal blades different from upper blades v.

v. Blades puberulent on both surfaces, short-villous also above and long-villous toward base; plant olive-green when dry . . . . . 77. P. olivaceum H. & C.

v. Blades with long and short soft hairs above, with dense velvety pubescence beneath; plant light- or yellow-green when dry . . 79. P. lanuginosum Ell.

r. Ligule 0.5 mm long or less or none w.

w. Axis of panicle hairy (pilose); panicles 4-8 cm long; spikelets 1.2-2 mm long; blades 3-15 mm wide, 2-12 cm long x.

x. Sheaths glabrous except densely hairy collar; blades white-margined 5-12 mm wide, (4-)5-15 cm long; spikelets crowded; lower glume minute; spikelets 1.5 mm long; fruit bearing long hairs; perennial . . . . 60. P. arundinariae Trin.

x. Sheaths hairy; spikelets hairy; blades not white-margined y.

y. Spikelets oblique on pedicels, 1.2-1.4 mm long; blades 8-15 mm wide, 2-6 cm long, papillose-hispid toward base, heart-shaped at base; panicles 5-7 cm long . . . . 101. P. hirtum Lam.

y. Spikelets erect on pedicels; lower glume 1/3 as long as spikelet z.

z. Spikelets 1.5-1.6 mm long, sparsely pilose; sheaths papillose-hispid; widest blades 5-10 mm wide, 2.5-4.3 cm long, 4-5 times as long as wide, heart-shaped and clasping at base, sparsely hairy . . . . 95. P. Blakei Swallen

z. Spikelets 1.9-2 mm long, with dense spreading hairs; sheaths conspicuously retrorse-pilose; widest blades 3-8 mm wide, 4-12 cm long, 13-15 times as long as wide, long-ciliate on margins, not heart-shaped at base, pilose above and beneath . . . . 64. P. xalapense HBK.

w. Axis of panicle glabrous Aa.

Aa. Blades heart-shaped at base, clasping stem, 5-15 mm wide Ab.

Ab. Blades with white cartilaginous margins, 7-14 mm wide, 4-10 cm long; spikelets 1.6-1.8 mm long, hairy or nearly glabrous; sheaths usually longer than internodes, glabrous except on margins . . . . 80. P. sphaerocarpon Ell.

Ab. Blades without white margins, 6-12 mm wide, 7-13 cm long; spikelets 1-1.2 mm long, densely puberulent . . . . 81. P. erectifolium Nash

Aa. Blades not heart-shaped at base, not clasping stem Ac. cp.p.7.

Ac. Fruit bearing long hairs; apikelets 1.5-1.8 mm long; sheaths shorter than internodes Ad.

Ad. Stem retrorsely pilose (or almost glabrous), rooting at nodes; panicles 10-15 cm long; blades 10-25 mm wide, 5-15 cm long; sheaths pilose . . . . 48. P. Schiffneri Hackel

Ad. Stem glabrous or nearly so, creeping at base; nodes hairy; panicles 3-8 cm ; blades 7-19 mm wide, 6-11 cm long, falcate; sheaths hairy toward summit; spikelets 1.8 mm long . . . . . . 49. P. Schmitzii Hackel

Ac. Fruit glabrous; spikelets hairy Ae.

Ae. Sheaths, at least upper ones, glabrous or with few hairs near base; stems erect or ascending or spreading, often tufted; spikelets hairy, 1.4 mm long; blades with conspicuous white margins; blades 4-6 mm wide, 4-6 cm long; perennial . 82. P. albomarginatum Nash

Ae. Sheaths distincly hairy Af.

Af. Widest blades 8-15 mm wide, 4-7 cm long, about 5-7 times as long as wide; spikelets 1.5 mm long, pilose or nearly glabrous; stems decumbent or creeping; annual . . . . . . 51. P. trichoides Sw.

Af. Widest blades 3-8 mm wide, 4-12 cm long, 13-15 times as long as wide, long-ciliate on margins; sheaths conspicuously retrorsely pilose; spikelets with abundant spreading hairs; stems erect or spreading .. . . 64. P. xalapense HBK.

q. Spikelets and fruit glabrous (except sometimes scabrous keel) spikelets (1-)1.3-1.9(-2) mm long Ag. cp. p. 6

Ag. Spikelets attenuate at base, pear-shaped; blades 2-7 mm wide, 1-3 cm long, clasping at base, glabrous or sparsely pilose; panicles 2-5 cm long; lower glume acute, 1/2 as long as spikelet; annual . . 57. P. pyrularium H. & C.

Ag. Spikelets not attenuate at base; blades (6-)7-20 times as long as wide, (2-)5-30 mm wide; spikelets (1-)1.3-1.9 mm long Ah.

Ah. Spikelets arranged along 1 side of branches, dense, nearly sessile; branches pilose with long (2-3 mm) scattered hairs; blades 7-15 mm wide, 6-13 times as long as wide Ai.

Ai. Spikelets all on main branches Aj.

Aj. Panicles 5-15 cm long; spikelets 1.3-1.5 mm long; larger blades 6-10 mm wide, 5-20 cm long; stems not more than 1 m long; sheaths longer than internodes; axis of inflorescence hairy 39. P. pilosum Sw

Aj. Panicles 25-45 cm long; spikelets 1.8-1.9 mm long; larger blades 5-11 mm wide, 20-28 cm long; stems less than 1 m long . . . 43. P. hondurense Swallen

Ai. Spikelets, some of them, on very short secondary branches, usually on lower side of main branches; perennial Ak.

Ak. Blades 15-35 cm long, 12-30 mm wide; panicles 20-45 cm long; lower sheaths shorter than internodes Al.

Al. Spikelets 1.3 mm long; nodes hairy . . . . 40. P. milleflorum H. & C.

Al. Spikelets 1.8 mm long; nodes glabrous or sparsely hairy . . . . 97. P. stagnatile H. & C.

Ak. Blades 5-15(-20) cm long, 5-20 mm wide; panicles 5-30 cm long Am.

Am. Nodes hairy; blades 5-10(3-13) mm wide, mostly 5-8 cm long . . 38. P. polygonatum Schrader

Am. Nodes glabrous; larger blades 5-15 cm long; sheaths shorter than internodes An.

An. Spikelets 2 mm long; blades 4-12 mm wide, 1.5-6 cm long, with white undulate margins; annual . . . . 5. P. reptans L

An. Spikelets 1-1.6 mm long; blades without white margins, nearly glabrous Ao.

Ao. Blades narrowed toward base, 5-10(-15) mm wide, 5-12 cm long; spikelets 1-1.5 mm long; sheaths with dense hairy line on collar . . . . 42. P. laxum Sw.

Ao. Blades heart-shaped at base, 7-20 mm wide, 5-15(-20) cm long, glabrous on both surfaces; spikelets 1.5-1.6 mm long; perennial . . . 41. P. boliviense Hackel

Ah. Spikelets not on 1 side of branches, sometimes with long pedicels; infloresence open or contracted Ap.

Ap. Ligule (2-)3-4 mm long; sheaths mostly shorter than internodes Aq.

Aq. Blades glabrous or scaberulous, strictly erect; sheaths about 1/2 as long as internodes; lower glume obtuse or rounded, 2/3 as long as spikelet; stem erect . . . . 56. P. cyanescens Nees

Aq. Blades hairy on both surfaces; lower glume almost acute, 1/3 as long as spikelet; stem creeping at base . . . . 86. P. viscidellum Scribner

Ap. Ligule 0.5 mm long or shorter or none Ar.

Ar. Sheaths distinctly hairy (pilose) As.

As. Spikelets 1.5 mm long; longest blades 2-4 mm wide, 1.5-2.5 cm long, 6-7 times as long as wide; sheaths 0.6-0.8 mm thick, with stiff ascending or spreading hairs; spikelets 1.5 mm long . . . . 55. P. parvifolium Lam.

As. Spikelets 1.9-2 mm long; longest blades 3-8 mm wide, 4-12 cm long, 13-15 times as long as wide; sheaths retrorse-pilose; spikelets 1.9-2 mm long . cp. p. 9 . . . . 64. P. xalapense HBK.

Ar. Sheaths, at least upper ones, glabrous except on margins or collar or base At.

At. Stems sprawling or clambering, often rooting at lower nodes; sheaths shorter than internodes; perennial Au.

Au. Spikelets 1.8-2 mm long; lower glume 1/2 as long as spikelet; blades 15-25 mm wide, 10-20 cm long; fruit smooth; panicle 10-30 cm long . . . . 53. P. Bartlettii Swallen

Au. Spikelets 1.2-1.5 mm long; lower glume less than 1/2 as long as spikelet; basal blades similar to upper blades, not forming winter rosette Av.

Av. Lower glume minute, nerveless; fruit with long appressed hairs; basal blades similar to upper blades, not forming winter rosette; upper blades 5-12 mm wide, 4-15 cm long; spikelets 1.5 mm long, crowded . . . . 60. P. arundinariae Trin.

Av. Lower glume 1/5 as long as spikelet; fruit glabrous; blades 10-20 mm wide, (7-)8-15 cm long . . . . 52. P. trichanthum Nees

At. Stems erect or ascending or spreading, often tufted Aw.

Aw. Axis of panicle pilose; lower glume 1/3 to 1/2 as long as spikelet; fruit glabrous; basal blades different from upper blades, forming winter rosette; stems in dense spreading tufts Ax.

Ax. Spikelets 1.3-1.5 mm long; blades pilose on both surfaces . . . . 66. P. strigosum Muhl.

Ax. Spikelets 1.5-1.6 mm long; blades glabrous above, ciliate on margins . . . . . 65. P. polycaulon Nash

Aw. Axis of panicle glabrous; sheaths glabrous or with few long hairs near base Ay.

Ay. Panicle very narrow, few-flowered; blades 2-4 mm wide or narrower, 4-15 cm long, usually with turned under (revolute) margins, then 0.3-0.5 mm wide; panicle 1-2 cm long; spikelets 1.4-1.6 mm long . . . . 36. P. stenodes Griseb.

Ay. Panicle open, many-flowered; blades 2-6 mm wide, 1.5-6.5 cm long; panicle 2.5-5 cm long; stems densely tufted Az.

Az. Spikelets 1.1-1.2 mm long . . . . .83. P. chamaelonche Trin.

Az. Spikelets 1.5-1.6 mm long 37. P. furvum Swallen

p. Spikelets 2-3 mm long Ba. cp. p. 6

Ba. Stem-blades (2-)3-9 times as long as wide; perennial except P. alcobense which is uncertain Bb. cp. p. 13

Bb. Ligule of hairs (2-)3-5 mm long; sheaths hairy; spikelets 1.9-2.4 mm long, hairy; basal blades wider and shorter proportionately than upper blades Bc.

Bc. Blades velvety-hairy; spring stems more than 75 cm tall; spikelets 2 mm long; larger blades 5-13 cm long; cp. p. 14 . . 86. P. viscidellum Scribner

Bc. Blades somewhat villous; spring stems less than 50 cm tall; spikelets 1.9-2 mm long; larger blades 4-7 cm long; cp. p. 7 . . . . 77. P. olivaceum H. & C.

Bb. Ligule very short, 0.5-1 mm long, or none Bd.

Bd. Lower glume 2/3 to 3/4 as long as spikelet; spikelets 2-2.7 mm long Be.

Be. Blades 10-30 mm wide, 4-15 cm long, 4-5 times as long as wide, at least sparsely hairy; panicles 10-20 cm long; spikelets glabrous or sparsely hairy . . . . . 59. P. Sellowii Nees

Be. Blades 5-10 mm wide, 4-7 cm long, 6-8 times as long as wide Bf.

Bf. Spikelets hairy; blades 7-10 mm wide, 4-7 cm long, papillose-pilose; panicle 10 cm long or shorter; spikelets 2.7 mm long . . . . 96. P. pantrichum Hackel

Bf. Spikelets glabrous; blades 5-10 mm wide, 4-6 cm long; plant glabrous . . . . 54. P. helobium Mez

Bd. Lower glume not more than 1/2 as long as spikelet; spikelets 2-2.7 mm long Bg.

Bg. Spikelets sessile or almost sessile, glabrous, arranged along 1 side of branches; pedicels up to 1 mm long Bh.

Bh. Fruit transversely wrinkled; larger blades 4-12 mm wide; lower glume rounded or truncate, 1/6 as long as spikelet; stem long-creeping . . . 5. P. reptans L.

Bh. Fruit not transversely wrinkled; lower glume acute, 1/3 to 1/2 as long as spikelet; stem decumbent at base, rooting at lower nodes Bi.

Bi. Sterile lemma bearing 2 crater-like glands; panicles 3-14 cm long; spikelets 2 mm long; blades 8-18 mm wide, 1.5-5 cm long . . . . .46. P. pulchellum Raddi

Bi. Sterile lemma without glands; nodes hairy; spikelets 2.5-2.7 mm long; perennial Bj.

Bj. Blades 1-5 cm long, 3-15 mm wide; panicles 1-5 cm long . . 44. P. stoloniferum Poiret

Bj. Blades 5-11 cm long, 8-15 mm wide; panicles 4-11 cm long . . 45. P. frondescens Meyer

Bg. Spikelets on pedicels, not on 1 side of branches; longest pedicels 1-2(-3) mm long; panicle open Bk.

Bk. Lower glume 1/5 to 1/4 as long as spikelet; longer blades 12-25 mm wide Bl.

Bl. Spikelets 2.3-2.5 mm long; stem villous; blades hairy above and beneath 91. P. cayoense Swallen

Bl. Spikelets 2 mm long; stem papillose-pilose; blades usually hairy, very scabrous on margins and upper surface . . 50. P. parviglume Hackel

Bk. Lower glume 1/3 to 1/2 as long as spikelet Bm.

Bm. Blades glabrous except on margins, or minutely or sparsely hairy; nodes hairy; spikelets 2.7 mm long, sparsely hairy; blades 5 mm wide, 4-7.5 cm long . . . . 92. P. alcobense Swallen

Bm. Blades abundantly hairy Bn.

Bn. Panicle 10-15 cm long; sheaths usually much shorter than internodes; margins of glumes and sterile lemma sparsely pilose; spikelets 2.5 mm long 58. P. Haenkeanum Presl

Bn. Panicle 1-8(-9) cm long; spikelets 2-2.4 mm long Bo.

Bo. Nodes hairy; spikelets glabrous, 2.2-2.4 mm long; blades hairy, 7-13 mm wide, 5-9 cm long; sheaths densely hairy . . 93. P. ramiparum Swallen

Bo. Nodes glabrous; spikelets 2-2.1 mm long Bp.

Bp. Blades 6-12 mm wide, 2-7 cm long, hairy above and beneath; spikelets glabrous or sparsely pilose; lower glume 1/3 as long as spikelet . . . . 94. P. furtivum Swallen

Bp. Blades 3-8 mm wide, 2-8 cm long, with very narrow white margins Bq.

Bq. Blades glabrous above; stems not decumbent at base . . . . 84. P. lancearium Trin.

Bq. Blades softly puberulent above and beneath; stems decumbent at base . . . . 85. P. patulum (Scribner & Merrill) Hitchc.

Ba. Stem-blades 10-50 times as long as wide Br. cp. p. 11

Br. Blades 6 cm wide, 100 cm long, at middle of stem; nodes densely appressed-hairy; stem 1-2 cm thick . . . . 98. P. grande H. & C.

Br. Blades 0.2-4 cm wide Bs.

Bs. Spikelets or fruit hairy Bt. cp. p. 14

Bt. Spikelets attenuate at base, their hairs swollen at base; blades 5-12 cm long, 10-15 (-17) times as long as wide; spikelets 2-2.5 mm long; perennial Bu. cp. p.

Bu. Spikelets 2.4-2.5 mm long; larger blades 8-12 cm long; autumnal blades flat . . . . 68. P. angustifolium Ell.

Bu. Spikelets 2 mm long; branches appressed; autumnal blades rolled up Bv.

Bv. Lowest internodes crisp-hairy; larger blades 4-6 mm long . . . . 67. P. aciculare Desv.

Bv. Lowest internodes glabrous; larger blades 8-12 cm long; plants glabrous or nearly so . . . . 71 . P. neuranthum Griseb.

Bt. Spikelets not attenuate at base; larger blades 2-20 cm long Bw.

Bw. Ligule very short, inconspicuous, less than 1 mm long Bx.

Bx. Spikelets 2 mm long; nodes, at least upper ones, bearded; sheaths, except sometimes the lowest, glabrous; longest blades 5-20 cm long . . . . 72. P. nitidum Lam.

Bx. Spikelets 2.4-2.8 mm long, glabrous or upper glume sparsely pilose By.

By. Sheaths glabrous except densely ciliate margins; panicles 10-16 cm long; blades glabrous or sparsely hispid, ciliate at base 88. _P. albomaculatum_ Scribner

By. Sheaths papillose or papillose-hispid or papillose-pilose, as long or longer than internodes Bz.

Bz. Blades 4-9 mm wide, 5-10 cm long; spikelets 2.4 mm long; fruit glabrous . . . . 12. _P. alsophilum_ Swallen

Bz. Blades 9-18 mm wide, 13-22 cm long; spikelets 2.9-3 mm long; fruit silky-villous . . . . 100. _P. incumbens_ Swallen

Bw. Ligule of hairs (2-)3-5 mm long Ca.

Ca. Sheaths glabrous Cb.

Cb. Spikelets 2 mm long, finely hairy; blades 3-6 cm long . . . . 76. _P. multirameum_ Scribner

Cb. Spikelets 3 mm long, hairy; blades 10-15 mm qide, 5-12 cm long, glabrous; spikelets on border line for this place in key . . . . 87. _P. Joorii_ Vasey

Ca. Sheaths hairy; spikelets 1.9-2.4 mm long; larger blades 5-13 cm long Cc.

Cc. Blades velvety-hairy above and beneath; spring stems more than 75 cm tall; spikelets 2 mm long, hairy or glabrous; cp. p. 11 . . . . 86. _P. viscidellum_ Scribner

Cc. Blades somewhat villous or pilose; spring stems less than 50 cm tall; spikelets 2.2-2.4 mm long, papillose-hairy; larger blades 6-11 cm long Cd.

Cd. Stems conspicuously hairy with long spreading hairs; autumnal stems prostrate; spikelets 2.2-2.3 mm long . 78. _P. villosissimum_ Nash

Cd. Stems with appressed hairs; autumnal stems stiffly ascending 75. _P. pseudopubescens_ Nash

Bs. Spikelets glabrous Ce. cp. p. 13

Ce. Nodes hairy Cf.

Cf. Panicle 20-60 cm long; spikelets 2-3.2 mm long Cg.

Cg. Fruit transversely wrinkled; lower glume 1/3 as long as spikelet; blades glabrous or nearly so, 10 mm wide, 30-50 cm long or longer; spikelets 3 mm long . . 24. _P. maximum_ Jacq.

Cg. Fruit smooth; lower glume 1/2 as long as spikelet Ch.

Ch. Blades hairy on both surfaces, 3-5(-12) mm wide, 13-17 cm long; spikelets 2.7-3.2 mm long . . . . . . 22. _P. Ghiesbreghtii_ Fourn.

Ch. Blades glabrous or nearly so on both surfaces, 15-40 mm wide, 30-60 cm long; spikelets 2 mm long . . . . 23. P. hirsutum Sw.

Cf. Panicle 2-15(-20) cm long; blades hairy above and beneath, 2-10 mm wide, 2-10(-25) cm long Ci.

Ci. Spikelets 1.8-1.9 mm long, hairy; sheaths shorter than internodes; blades 9-13 mm wide, 5-13 cm long; branches of panicle hairy 86. P. viscidellum Scribner

Ci. Spikelets 2.2-3 mm long, 1/2 as long as spikelet or shorter Cj.

Cj. Stems erect; spikelets 2.2 mm long; blades 5-8 mm wide, 12-20 cm long; annual . . . . 18. P. cayennense Lam.

Cj. Stems spreading or decumbent or prostrate or clambering or erect, often rooting at the lower nodes; spikelets 2.4-3 mm long; blades 2-9 mm wide, 5-10 cm long Ck.

Ck. Blades almost glabrous except on margins and near base; spikelets 2.4-2.5 mm long; sheaths usually longer than internodes; perennial . . . . .16. P. umbonulatum Swallen

Ck. Blades hairy on both surfaces; spikelets 2.5-3 mm long; sheaths shorter than internodes; perennial . . . . .13. P. venezuelae Hackel

Ce. Nodes glabrous Cl. cp. p. 14

Cl. Panicles very narrow, few-flowered, 3-8 cm long; blades 2-4 mm wide, 4-15 cm long; spikelets 2.2-2.8 mm long; blades usually more than 20 times as long as wide; perennial . . . . .25. P. tenerum Beyr.

Cl. Panicles many-flowered, usually wider; ligule 0.2-1.5 mm long Cm.

Cm. Blades with narrow white margins; sheaths on main stem much shorter than internodes; pedicels shorter thanspikelets; blades 4-10 mm wide, 7-12 cm long; spikelets 2.2-2.4 mm long perennial . . . . 15. P. guatemalense Swallen

Cm. Blades without white margins Cn.

Cn. Fruit strongly transversely ridged; longest blades9-20 mm wide, 9-26 cm long; spikelets 2.5-3 mm long; annual . . 4. P. fasciculatum Sw.

Cn. Fruit not transversely ridged Co.

Co. Panicles 4.5-5.5 cm long; lowermost branch 1-1.5 cm long; sheaths glabrous except densely hairy collar, mostly shorter than internodes; blades 4-9 mm wide, 4-10 cm long . 14. P. breviramosum Swallen

Co. Panicles 8-20 cm long; lower glume 1/4 as long as spikelet, truncate or widely triangular; sheaths glabrous; spikelets 2.5 mm long; blades 5-8 mm wide, about 10 cm long . . . . 7. P. chloroticum Nees

ANNOTATED LIST OF SPECIES OF PANICUM
known to occur in Central America.

References to Hitchcock on the following pages are to A. S. Hitchcock, Grasses of Central America, Contr. U. S, Nat. Herb. 24:557-802. 1922. Descriptive data are sometimes given, especially in cases where the information is not always found in other publications.

1. P. geminatum Forsk., Fl. Aegypt. Arab. 18.1775.
Sheaths inflated. Similar to P. paludivagum.
Guatemala, Salvador, Costa Rica, Panama.
Nicaragua, Dept. Zelaya, Puerto Isabel, Atwood 2938 (SEY, SMU, BM, GH, F).
Dept. Leon, Leon Viejo, Dudey 1522 (VT): Seymour 1557 (ENAG, SEY, MO, UC).
Dept. Managua, Managua, Grant 1103 (GH).
Sierras de Managua, Grant 1075 (GH), 1076 (GH).
Without definite locality, Garnier 1494 (GH), 4424 (GH).

2. P. paludivagum H. & C., Contr. U. S. Nat. Herb. 15:32, f. 13. 1910. Blades 3-6 mm wide. Florida, Texas, Mexico, Guatemala, S. A.

3. P. purpurascens Raddi, Agrost. Bras. 47. 1823.
P. barbinode Trin., Mem. Acad. St. Petersburg VI. Sci. Nat. 1:256. 1834. Parana Grass or Para.
Similar in habit to Brachiaria plantaginea (Link) Hitchc.
British Honduras, Guatemala (FLAS), Honduras, Salvador, Costa Rica, Panama.
Nicaragua, Dept. Zelaya, Corn Island, Seymour 4401 (SEY, F, MO, UC, NY, WDP).
Dept. Chinandega, Chinandega, Baker 2053 (GH).
Dept. Managua, La Calera (ENAG).
Dept. Rio San Juan, San Bartolo, Seymour 6143 (VT).
Without definite locality, Garnier 1537 (GH), A-1234 (GH).

4. P. fasciculatum Sw., Prodr. Veg. Ind. Occ. 22. 1788. Zacate de Milpa. Nodes glabrous. Florida, Mexico (FLAS), in all countries of Central America, W. I. to S. A.

Nicaragua. Dept. Zelaya, a lo largo Rio Grande, Molina 2343 (GH).

Dept. Chinandega, Ameya, MHV 7177 (GH).

Dept. Boaco, San Francisco, Seymour 6059 (ENAG, SEY, SMU, BM, GH, F, MO, UC, NY, WDP).

Dept. Managua, Managua, Seymour 6106 (FLAS), Seymour 6290 (ENAG, SEY, SMU, BM, GH, F, MO, UC, NY, WDP, MICH).

Tipitapa (ENAG).

Dept. Rivas, Rivas 3905 (ENAG).

Without definite locality, Garnier 1558 (GH).

5. P. reptans L., Syst. Nat. ed. 10. 2:870. 1759. To prevent this species from being confused with P. repens L., with similar name and some similar characters, note the following key. Both species are with creeping rootstocks or bases; spikelets glabrous; lowest glume truncate; basal leaves similar to upper leaves.

A. Annual; fruit transversely ridged; spikelets secund; pedicels 1 mm long; blades 4-12 mm wide, 1.5-6 cm long, 4-5 times as long as wide . . . . 5. P. reptans L.

A. Perennial; fruit not transversely ridged; spikelets not secund, long-pediceled; blades 2-5 mm wide, 8-25 cm long, 40-50 times as long as wide; lower glume 1/5 as long as spikelet . . . . 30. P. repens L.

Texas to Florida, Mexico (FLAS), Costa Rica, Old World.

Nicaragua, Dept. Matagalpa, Calabazas, Seymour 2577 (SEY, SMU).

Dept. Boaco, San Francisco, Seymour 6058 (VT).

Teustepe, Seymour 2415 (SEY, MO).

Dept. Rivas, Rivas 3919 (ENAG).

Without definite locality, Garnier 1528 (GH).

6. P. molle Sw., Prodr. Veg. Ind. Occ. 22. 1788; non Mx., Fl. Bor. Amer. 1:47. 1803. Spikelets and axis of inflorescence with conspicuous spreading hairs.

Mexico (FLAS), Guatemala, Salvador, Costa Rica, Panama, W. I. to Argentina.

Nicaragua, Dept. Chinandega, Coseguina Volcano, Howell 10255 (GH).

Dept. Managua, Tipitapa, Seymour 3433 (ENAG, SEY, SMU, BM, GH, F, MO, UC, NY, WDP, WIS, MICH).

Dept. Rivas, El Limon (ENAG);

Sapoa, Seymour 1885 (SEY, NY).

Without definite locality, Garnier 1534 (GH).

7. P. chloroticum Nees, in Trin. Gram. Pan. 236. 1826. Sheaths not noticeably inflated. Spikelets glabrous, about 2.5 mm long. Mexico, Panama (GH). Nodes glabrous.

8. P. aquaticum Poiret, in Lam. Encycl. Suppl. 4:281. 1816. Mexico, British Honduras, Guatemala, Costa Rica (Brittonia 23: 293. 1971), Cuba, S. A.
Nicaragua, Dept. Zelaya, Puerto Isabel, Seymour 2895 (ENAG, SEY, SMU, GH, MO).

9. P. elephantipes Nees, Agrost. Bras. 165. 1829. Central America according to Hitchcock. Guatemala (GH), W. I., S. A.

10. P. hirticaule Presl, Rel. Haenk. 1:308. 1830. Spikelets glabrous. Lower glume acute or acuminate.
Mexico (FLAS), Salvador, Costa Rica, Panama, W. I., S. A.
Nicaragua, Dept. Managua, Managua, Seymour 2829 (SMU, BM), 3897 (VT), 6033 (ENAG, SEY, GH, MO), 6275 (SEY), 6284 (ENAG, SEY, F, MO).
Without definite locality, Garnier 4476 (GH).

11. P. pampinosum H. & C., Contr. U. S. Nat. Herb. 15:66, f. 48. 1910. Blades 5-10 mm wide, 5-12 cm long, 10-12 times as long as wide. New Mexico, Arizona, Mexico, Guatemala.
Nicaragua, without definite locality, Garnier 4421 (GH).

12. P. alsophilum Swallen, Contr. U. S. Nat. Herb. 29:422. 1950. Guatemala. Nodes hairy.

13. P. venezuelae Hackel, Oesterr. Bot. Zeitschrift 51:368. 1901. Guatemala, Venezuela, Brazil. Nodes hairy.

14. P. breviramosum Swallen, Contr. U. S. Nat. Herb. 29: 419. 1950. Guatemala. Nodes glabrous.

15. P. guatemalense Swallen, Journ. Wash. Acad. Sci. 23: 460. 1933. Guatemala.

16. P. umbonulatum Swallen, Contr. U. S. Nat. Herb. 29: 420. 1950. Spikelets 2.4-2.5(-3) mm long. Nodes hairy. Guatemala, Honduras.

17. P. sonorum Beal, Grasses N. Amer. 2:130. 1896. Blades "elongate", 15-30 mm wide. Spikelets glabrous, 3-3.3 mm long. Yuma, Ariz., El Salvador, San Salvador, where probably introduced, according to Hitchcock.
Nicaragua, Dept. Chinandega, Cosequina (ENAG).

18. P. cayennense Lam., Tabl. Encycl. 1:173. 1791. S. Mexico, British Honduras, Honduras according to Hitchcock, Costa Rica, Panama, W. I., n. S. A. Nodes hairy.

19. P. hispidifolium Swallen, Contr. U. S. Nat. Herb. 29: 424. 1950. P. hispidum Swallen, Contr. U. S. Nat. Herb. 29: 269. 1949; non Forst. 1786; non Muhl. 1817. Spikelets at tips of branches. Blades 6-13 mm wide, 15-30 cm long. Honduras.
Nicaragua, Dept. Managua, Tipitapa (ENAG).

20. P. sublaeve Swallen, Contr. U. S. Nat. Herb. 29:424. 1950. P. rigidum Swallen, Ann. Mo. Bot. Gard. 30:215. 1943; non Balif. 1884. A few short hairs at tip of fruit are easily overlooked. From the original description: Sheaths longer than internodes; leaves with margins and lower surface glabrous, upper surface pilose or villous; lower glume 1.5 mm long, acute, upper glume and sterile lemma acute, exceeding fruit. Panama.

21. P. lepidulum H. & C., Contr. U. S. Nat. Herb. 15:75, f. 64. 1910. Mexico, Guatemala, Nicaragua, Omotepe Is. according to Hitchcock; Panama ?

22. P. Ghiesbreghtii Fourn., Mex. Pl. 2:29. 1886. Spikelets glabrous. See Burkhart, Arturo, Fl. Illustr. de Entre Rios (Argentina) 2:309-310. 1969, where he says: spikelets 2.7-3.2 mm long; blades approximately 3-5(-12) mm wide, 13-17 cm long; ligule 1.5-2.5 mm long; panicles 20-30 cm long. (translation mine). Blades hairy on both surfaces. Nodes hairy. Mexico, Costa Rica, Panama, W. I. to Brazil and Bolivia, Argentina. Nicaragua, Dept. Rivas, El Carabato (ENAG).

23. P. hirsutum Sw., Fl. Ind. Occ. 1:173. 1797. Nodes hairy. Honduras according to Hitchcock. Guatemala (FLAS), Costa Rica, Panama to Ecuador, Brazil.

24. P. maximum Jacq., Coll. Bot. 1:76. 1786. Zacate de Guinea, Guinea Grass. Longest blades 30-50 cm long or longer. Introduced from Africa. For fuller comment, see Williams, L. O., Phytologia 28:226. 1974. Nodes hairy. Florida, Mexico (FLAS), Guatemala, Honduras, Panama (FLAS), to Ecu Ecuador, Brazil. Africa.

Nicaragua, Dept. Zelaya, between Rio Grande and Wenkala, Molina 2219 (GH).
Dept. Matagalpa, Matagalpa, Zelaya 2307 (ENAG, SEY, SMU, BM, GH, F, MO, UC, NY, WDP, MICH).
Dept. Leon, Momotombo, El Diamente (ENAG).
Dept. Managua, La Calera (ENAG).
Managua, Seymour 2448 (VT).
Managua, Zelaya 735 (ENAG, SEY, SMU, BM, GH, F, MO), 2244 (ENAG, SEY, SMU, BM, GH, F, MO, UC, NY, WDP, MICH), 2246 (FLAS, B).

25. P. tenerum Beyr., in Trin. Acad. St. Petersb. Mem. VI Sci. Nat. 1:341. 1834. North Carolina to Florida and Texas, British Honduras, W. I.

26. P. rigidulum Bosc ex Nees in Mart. Fl. Bras. 2(1):163. 1829. P. agrostoides Bosc ex Sprengel, Pl. Pugill. 2:4. 1815. For discussion of name, see Voss, E. G. Rhodora 68:443. 1966. U. S. east of Rocky Mts., Calif., Vancouver Is., British Honduras.

27. P. hians Ell., Bot. S. C. and Ga. 1:118. 1816.
SE United States, SE of Rocky Mts., New Mexico, Mexico, Guatemala, Honduras, Panama.

28. P. bulbosum HBK., Nov. Gen. & Sp. 1:99. 1816.
New Mexico, Arizona, Mexico, Guatemala, n. S. A.
Nicaragua, Dept. Managua, Managua, Seymour 6274 (SEY).
Tipitapa, Seymour 3439 (SEY, SMU).

29. P. paucifolium Swallen, Contr. U. S. Nat. Herb. 29:417. 1950. Honduras.

30. P. Lundellii Swallen, Journ. Washington Acad. Sci. 28:9. 1938. British Honduras.

31. P. repens L., Sp. Pl. ed. 2, 1:87. 1762.
Stems arising from horizontal creeping rootstocks; blades 2-5 mm wide, 12-20 cm long; spikelets 2.2-2.5 mm long; lowest glume truncate, 1/5 as long as spikelet. For fuller description, see Chase, Agnes, Manual of Grasses of the U. S. 697. 1951, where illustrated. See also P. reptans L., p. 17, this article. Spikelets on pedicles. Nicaragua, Flint (GH). Specimen not seen.

32. P. ichnanthoides Fourn., Mex. Pl. 2:30. 1886.
Blades 2.5-3.5 cm long. S. Mexico, British Honduras, Honduras.
Nicaragua, Dept. Carazo, Jinotepe. Specimens not seen.

33. P. altum H. & C., Contr. U. S. Nat. Herb. 17:488. 1915.
2 specimens in the Gray Herbarium from Central America are Hitchcock 507, Panama; and Peck 123, British Honduras. According to my measurements, spikelets on these specimens measure 2.9-3.9 mm long.
British Honduras, Honduras, Costa Rica, Panama (USF).
Nicaragua, Dept. Managua, Managua, Seymour 6094 (SEY, MO).

34. P. virgatum L., Sp. Pl. 59. 1753.
Reported in British Honduras, Belize. Rhodora 77:129. 1975.

35. P. stenodoides F. T. Hubb., Proc. Amer. Acad. 49:497. 1913. British Honduras, Costa Rica, Panama, Trinidad, n. S. A.

36. P. stenodes Griseb., Fl. Brit. W. Ind. 547. 1864.
Guatemala, Costa Rica, W. I., n. S. A. Axis of panicle glabrous.
Nicaragua, Comarca del Cabo, Bihmona, Seymour 5695 (VT).

37. P. furvum Swallen, Contr, U. S. Nat. Herb. 29:416. 1950. Guatemala.

38. P. polygonatum Schrader, in Schultes Mant. 2:256. 1824.
S. Mexico, British Honduras, Guatemala (FLAS), Honduras, Salvador, Costa Rica, Panama, S. A.
Nicaragua, Dept. Zelaya, "a lo largo del Rio Grande", Molina 2072 (GH), 2347 (GH).
Bluefields, Seymour 4132 (VT).
Nueva Guinea, Seymour 5384 (VT).
Dept. Rio San Juan, Castillo, Nelson 5190 (SEY, SMU, BM, GH, F, MO).

39. P. pilosum Sw., Prodr. Veg. Ind. Occ. 22. 1788. Mexico, Guatemala (FLAS), Honduras (Hitchock), Panama (FLAS), W. I., S. A.

Nicaragua, Comarca del Cabo, Bihmona, Seymour 5702 (SEY, SMU, GH).
Bilwaskarma, Seymour 5784 (SEY).
Cororia Bush, Seymour 3759 (VT).
France ya Sirpi, Seymour 5635 (SEY, MICH).
Miguel Bikon, Robbins 5862 (SEY, UC).
Puente Pozo Azul, Seymour 4740 (VT, MO).
Waspan, Seymour 3655 (VT).
Dept. Zelaya, Bluefields, Dudey 662a (VT), 659 (SMU, BM, GH).
Atwood & Moore 344 (SEY).
Corn Island, Seymour 4296 (SEY, F).
Madregara, Seymour 3256 (SEY).
Puerto Cabezas, Svenson 4548a (SEY).
Puerto Isabel, Atwood 2855 (BM, GH);
Seymour 2897 (SMU), 2970 (SEY).
Punta Masaya, Seymour 683 (F, MO), 684 (VT).

40. P. milleflorum H. & C., Contr. U. S. Nat. Herb. 17:494, f.70. 1915. The original description states that there are secondary branchlets in the inflorescence, although this is sometimes denied. British Honduras, Costa Rica (Brittonia 23:293. 1971), Panama to Brazil.

41. P. boliviense Hackel, Repert. Sp. Nov. Fedde 11:19. 1912. Mexico (FLAS), British Honduras, Guatemala, Costa Rica (Brittonia 23:293. 1971), Panama, Cuba to S. A.

42. P. laxum Sw., Prodr. Veg. Ind, Occ. 23. 1788. Mexico (FLAS), British Honduras, Honduras (Hitchcock), Salvador (Hitchcock), W. I., S. A.

Nicaragua, Comarca del Cabo, Bihmona, Seymour 5698 (SEY),
Seymour 5700 (SMU, BM).
Waspan, Seymour 3572 (SEY, SMU).
Dept. Zelaya, a lo largo de Rio Grande, Molina 2184 (GH).
Limbaika, Seymour 4920 (SEY, UC).
Puerto Isabel, Seymour 2896 (ENAG, SEY, SMU, BM, GH, F, MO, UC, NY, WDP, MICH).
Seymour 2965 (ENAG, FLAS).
Punta Masaya, Seymour 685a (VT).
Dept. Matagalpa, Matagalpa, Seymour 2165 (VT).
Dept. Chontales, Acoyapa, Seymour 1756 (SEY, SMU).
Santo Tomas, Seymour 6301 (SEY, GH).
Dept. Rio San Juan, San Bartolo, Robbins 6219 (ENAG, SEY, F, MO, UC).
San Juan del Norte, Seymour 5295 (ENAG, SEY, BM, MO, FLAS).
Without definite locality, Garnier 4420 (GH).

43. P. hondurense Swallen, Contr. U. S. Nat.Herb. 29:270. 1948. Honduras.

44. P. stoloniferum Poiret, in Lam. Encycl. Suppl. 4:274. 1816. Spikelets glabrous, sessile.
S. Mexico, Guatemala, Honduras, Panama, W. I., S. A.
Nicaragua, Dept. Zelaya, Madregara, Seymour 3105a (MO); Atwood 3215 (VT).
Dept. Chontales, Santo Domingo, Seymour 3382 (ENAG, SEY, SMU, BM, GH, F, MO, UC, NY, WDP, WIS).
Santo Tomas, Seymour 2753 (ENAG, SMU, BM, GH, F. MO, UC, NY, WDP, WIS).

45. P. frondescens Meyer, Prim. Fl. Esseq. 56. 1818. Spikelets sessile. S. Mexico, British Honduras, Guatemala, Costa Rica, Panama (USF), W. I., S. A.
Nicaragua, Dept. Zelaya, a lo largo del Rio Grande, Molina 2266 (GH).

46. P. pulchellum Raddi, Agrost. Bras. 42. 1823. Blades ovate. Spikelets sessile, secund. S. Mexico, British Honduras, Guatemala, Costa Rica, Panama to n. S. A.
Nicaragua, Dept. Zelaya, Molina 2260 (GH).
Comarca del Cabo, Bilwaskarma, Seymour 4834 (VT).
Dept. Matagalpa, Tuma, Seymour 4041 (VT).

47. P. biglandulare Scribner & Smith, U. S. Dept. Agr. Div. Agrost. Bull. 4:13, pl. 4. 1897. Guatemala.

48. P. Schiffneri Hackel, Ergeb. Bot. Exped. Akad. Wiss. Südbras. 11. 1906. S. Mexico, Guatemala, Salvador, Costa Rica, Panama, W. I. to Brazil.
Nicaragua, Sierra de Managua, Garnier A-1246 (GH).

49. P. Schmitzii Hackel, Ann. Naturhist. Hofmus. Wien. 17: 254. 1902. S. Mexico, Guatemala.

50. P. parviglume Hackel, Oestrr. Bot. Zeitschr. 51:429. 1901. Blades 12-25 mm wide, 5-16 cm long.
Mexico, Guatemala, Costa Rica.

51. P. trichoides Sw., Prodr. Veg. Ind. Occ. 24. 1788. All Central American countries and Jamaica (Hitchcock).
Nicaragua, Dept. Nueva Segovia, Ocotal, Rio Grande, Molina 2326 (GH).
Ocotal, Atwood 760 (ENAG, SEY, SMU, BM, GH).
Ocotal, Dudey 775 (ENAG, SMU, BM, GH, F, MO, UC, NY, WDP, MSU).
Ocotal, Seymour 846 (ENAG, GH, F, MO).
Dept. Managua, La Calera (ENAG).
Managua, Garnier 1487 (GH).
Tipitapa, Zelaya 39 (ENAG, SEY, SMU, BM, GH. F, MO).
Dept. Masaya, Masatepe (ENAG).
Lake Masaya, Nichols 114 (SEY, UC).

51. P. trichoides Sw., cont.
Dept. Carazo, Jinotepe, Hitchcock 8693 (GH).
Dept. Granada, Volcan Mombacho, Dudey & Moore 1971 (VT).
Dept. Rivas, Ameyo (ENAG). La Virgen (ENAG).
Penas Blancas, Seymour 1851 (ENAG, SEY, UC, NY, WDP).
Without definite locality, Garnier 4377 (GH).

52. P. tricanthum Nees, Agrost. Bras. 210. 1829.
P. microspermum Fourn. ex Hemsley, Biol. Centr. Amer. Bot. 3:492. 1885. Axis of panicle glabrous.
Mexico and W. I. to Paraguay (Hitchcock).
Nicaragua, Dept. Zelaya, a lo largo del Rio Grande, Molina 2102 (GH).
Siuna, Seymour 3187 (VT).
Dept. Managua, Managua, Garnier 1553 (GH).
Dept. Carazo, Jinotepe, Hitchcock 8669 (GH).

53. P. Bartlettii Swallen, Carnegie Inst. Washington Pub. 436:346. 1934. Similar to P. trichoides Sw. Main axis and branches indistinguishable, glabrous.
S. Mexico, British Honduras, Guatemala.

54. P. helobium Mez in Ekman Ark. för Bot. 11:23, pl. 1, f. 6. 1912. Costa Rica, Brazil to Argentina.

55. P. parvifolium Lam., Tabl. Encycl. 1:173. 1791. Axis of panicle glabrous.
Costa Rica, W. I. to Paraguay (Hitchcock), Africa.
Nicaragua, Comarca del Cabo, Bihmona, Seymour 5703 (ENAG, SEY, SMU, BM, GH, F, MO, UC, NY, WDP, MICH).
Old Bridge, Seymour 5840 (SEY, SMU)
Puente Pozo Azul, Nelson 4726 (ENAG, SEY, NY).
Seymour 4739 (SMU, BM, GH, F, MO, UC).
Waspan, Seymour 3659 (ENAG, SEY, SMU, BM, GH, F, MO, UC, NY, WDP, MICH).
Dept. Zelaya, Limbaika, Seymour 4922 (VT).
Puerto Cabezas, Svenson 4485 (VT).

56. P. cyanescens Nees, Agrost. Bras. 220. 1829.
S. Mexico, British Honduras, trinidad to Brazil (Hitchcock), n. S. A. Nicaragua, Comarca del Cabo, Bihmona, Seymour 5757 (SEY, MO).
France ya Sirpi, Seymour 5605 (ENAG, SEY, SMU, BM, GH, F, MO, UC, NY, WDP, MICH, FLAS).
Old Bridge, Seymour 5839 (VT).
Waspan, Seymour 3658 (VT).
Dept. Zelaya, Tamla, Seymour 5976(SEY, SMU, BM, GH, MO).

57. P. pyrularium H. & C., Contr. U. S. Nat. Herb. 17: 508, f. 95. 1915. Blades 2-7 mm wide, 1-3 cm long; spikelets 1.5 mm long, attenuate at base, glabrous. Known only from type collection, Pittier 5416, Chiriqui, Panama.

58. P. Haenkeanum Presl, Rel. Haenk. 1:304. 1830.
Spikelets on pedicels. Mexico to Venezuela, Honduras, Costa Rica, Panama (Hitchcock).
Nicaragua, Comarca del Cabo, Bilwaskarma, Seymour 4697 (VT).
Waspan, Seymour 4665 (SEY, SMU, BM).

59. P. Sellowii Nees, Agrost. Bras. 153. 1829.
S. Mexico, British Honduras, Guatemala, Honduras (FLAS), Salvador, Costa Rica, Panama, W. I. to S. A.
Nicaragua, Comarca del Cabo, Waspan, Seymour 4665b (VT).

60. P. arundinariae Trin. ex Fourn., Mex. Pl. 2:25. 1886.
P. virgultorum Hackel, Oesterr. Bot. Zeitschrift 51:369. 1901.
S. Mexico, Guatemala, Honduras, Salvador, Costa Rica, Panama.

61. P. glutinosum Sw., Prodr. Veg. Ind. Occ. 24. 1788.
S. Mexico, Guatemala, Honduras, Costa Rica, W. I. to Paraguay.

62. P. Rudgei R. & S., Syst. Veg. 2:444. 1817.
S. Mexico, British Honduras, Costa Rica, Panama, Jamaica to Brazil (Hitchcock).
Nicaragua, Dept. Zelaya, Limbaika, Seymour 4977 (SEY).

63. P. Mertensii Roth in R. & S., Syst. Veg. 2:458. 1817.
P. megiston Schultes, Mant. 2:248. 1824.
Mexico, W. I. to Paraguay (Hitchcock), British Honduras (USF), Costa Rica, Panama, Cuba.
Nicaragua, Dept. Zelaya, Bluefields, Atwood 4182 (ENAG, SEY, MO, UC, NY, WDP).

64. P. xalapense HBK., Nov. Gen. and Sp. 1:103. 1816.
Included in P. laxiflorum Lam. in Gray's Man. ed. 8, 210. 1950. Chase separates these two species, treating P. laxiflorum as not in Central America. Axis of panicle pilose except in age.
E. & s. U. S., Mexico, Guatemala, Honduras, Costa Rica, W. I.
Nicaragua, Comarca del Cabo, Bilwaskarma, Seymour 5853 (MO, VT).
Dept. Jinotega, San Rafael del Norte, Miller & Griscom 134 (GH).

65. P. polycaulon Nash, Torr. Bot. Club Bul. 24:200. 1897.
Florida to Mississipi, British Honduras, W. I.
Nicaragua, Comarca del Cabo, Bilwaskarma, Seymour 4605 (SEY, SMU, GH, F, MO).

66. P. strigosum Muhl., in Ell., Bot. S. C. & Ga. 1:126. 1816. Axis of panicle pilose. SE U. S., s. Mexico, Guatemala, Costa Rica, Panama, W. I. to Colombia.
Nicaragua, Comarca del Cabo, Bilwaskarma, Seymour 4606, (VT), 4742 (SMU, BM, GH, F, MO, UC, NY, WDP).
La Tronquera, Molina 14892 (GH).
Waspan 2531 (ENAG).

67. P. aciculare Desv., ex Poiret in Lam. Encycl. Suppl. 4: 274. 1816. SE U. S., W. I., n. S. A. Reported in Central America by Hitchcock, p. 658. Occurrence here not confirmed.

68. P. angustifolium Ell., Bot. S. C. & Ga. 1:129. 1816.
N. J. to Fla. & Texas, Tenn., Ark.
Nicaragua, Dept. Jinotega, San Rafael del Norte, (Hitchcock).

69. P. fusiforme Hitchc., Contr. U. S. Nat. Herb. 12:222. 1909. SE U. S., British Honduras, W. I.

70. P. arenicoloides Ashe, Journ. Elisha Mitchell Soc. 16: 89. 1900. SE U. S., s. Mexico, Guatemala, Honduras, Cuba, n. S. A. Specimens not seen.
Nicaragua, Comarca del Cabo, Bilwaskarma, Seymour 4607 (SEY, NY).
Waspan, Atwood 3600 (SEY).

71. P. neuranthum Griseb., Cat. Pl. Cuba 232. 1866.
Fla., Miss., Rexas, Mo., British Honduras, W. I.

72. P. nitidum Lam., Tabl. Encycl. 1:172. 1791.
N. J., Va. to Fla., Mo., Texas, s. Mexico, Guatemala, W. I.

73. P. longiligulatum Nash, Torr. Bot. Club Bul. 26:574. 1899. SE U. S., Tenn., Central America.
Nicaragua, Comarca del Cabo, Bilwaskarma, Nelson 4629(SEY).
Puente Pozo Azul, Seymour 4576 (SEY), 4743 (SEY).
Dept. Zelaya, Siuna-Limbaika, Seymour 4976 (SEY).
Tamla, Seymour 5978 (SEY), 5979 (SEY).

74. P. Wrightianum Scribner, U. S. Dept. Agric. Div. Agrost. Bul. 11:44, f. 4. 1898.
E U. S., British Honduras, Cuba.

75. P. pseudopubescens Nash, Torr. Bot. Club Bul. 26:577. 1899. SE U. S., Mexico, Guatemala.

76. P. multirameum Scribner, U. S. Dept. Agric. Div. Agrost. Circ. 19:2. 1900. Mexico, Jamaica to Venezuela.
Guatemala (US).

77. P. olivaceum H. & C., Contr. U. S. Nat. Herb. 15:225, f. 234. 1910. Mexico, British Honduras, Guatemala, Honduras, Costa Rica, Panama to Venezuela, n. S. A.
Nicaragua, Dept. Zelaya, Macantaca Creek, Allen 6504 (GH).
Puerto Isabel, Atwood 2941 (SEY, UC).
Dept. Matagalpa, Santa Maria, Atwood 2080 (VT).
Without definite locality, Garnier 4531 (GH).

78. P. villosissimum Nash, Torr. Bot. Club Bul. 23:149. 1896. E U. S., e. Mexico, Guatemala, Honduras.

79. P. lanuginosum Ell., Bot. S. C. & Ga. 1:123. 1816.
N. J. to Fla., Tenn., Ark., Texas. Reported in British Honduras, Belize, Rhodora 77:128. 1975.

80. P. sphaerocarpon Ell., Bot. S. C. & Ga. 1:125. 1816. E U. S., Mexico to Venezuela, Central America except not known in Salvador.
Nicaragua, Comarca del Cabo, Bilwaskarma, Seymour 5852 (ENAG, SEY, SMU, GH, MO).
Puente Pozo Azul, Seymour 4577 (SEY, SMU, BM, F).
Waspan, 2538 (ENAG).
Dept. Zelaya, Puerto Cabezas, Svenson 4484 (VT).
Dept. Jinotega, San Rafael del Norte, Miller & Griscom 138 (US).

81. P. erectifolium Nash, Torr. Bot. Club Bul. 23:148. 1896. Blades glabrous, heart-shaped at base. For description, see Chase, Manual of Grasses of the United States, ed. 2, 665-666. 1950. Reported in British Honduras, Belize, Rhodora 77:128. 1975.

82. P. albomarginatum Nash, Torr. Bot. Club Bul. 24:40. 1897. SE U. S., Mexico (FLAS), Central America, Cuba (Hitchcock), British Honduras, Guatemala, Nicaragua (Hitchcock), Cuba. Specimens not seen. Occurrence in Nicaragua not confirmed.

83. P. chamaelonche Trin., Gram. Pan. 242. 1826. Axis of panicle glabrous. N. C. to Florida and La., Isla de Pinos, British Honduras.

84. P. lancearium Trin., Gram. Pan. 223. 1826. Blades 3-7 mm wide, 2-6 cm long. Lower glume 1/4 as long as spikelet. Spikelets on pedicels.
SE U. S., British Honduras, W. I.

85. P. patulum (Scribner & Merrill) Hitchc., Rhodora 8:209. 1906. P. lancearium Trin. var. patulum (Scribner & Merrill) Fern., Rhodora 36:80. 1934. Spikelets on pedicels. Blades 3-7 mm wide, 2-6 cm long. SE U. S., British Honduras, Hispaniola.

86. P. viscidellum Scribner, U. S. Dept. Agr. Agrost. Circ. 19:2. 1900. Nodes hairy. Mexico to Colombia (Hitchcock), Central America except not known in Salvador.

87. P. Joorii Vasey, U. S. Dept. Agr. Div. Bot. Bul. 8:31. 1889. P. commutatum Schultes var. Joorii (Vasey) Fern. Rhodora 39:388. 1937. S U. S. to Nicaragua (Hitchcock). Nicaragua, Dept. Jinotega, San Rafael del Norte, reported by Hitchcock.

88. P. albomaculatum Scribner, U. S. Dept. Agr. Div. Agrost. Circ. 19:2. 1900. Mexico, Guatemala.

89. P. transiens Swallen, Jour. Washington Acad. Sci. 21: 436. 1931. Mexico, Guatemala.

90. P. cordovense Fourn., Mex. Pl. 2:26. 1886. Mexico to Brazil and Bolivia (Hitchcock), Costa Rica, Panama.

91. P. cayoense Swallen, Contr. U. S. Nat. Herb. 29:418. 1950. British Honduras.

92. P. alcobense Swallen, Contr. U. S. Nat. Herb. 29:423. 1950. Spikelets on pedicels. Known only from Cerro Alcoba, Jalapa, Guatemala.

93. P. ramiparum Swallen, Contr. U. S. Nat. Herb. 29:423. 1950. Guatemala.

94. P. furtivum Swallen, Contr. U. S. Nat. Herb. 29:421. 1950. Spikelets on pedicels. Known only from Guatemala.

95. P. Blakei Swallen, Contr. U. S. Nat. Herb. 29:422. 1950. Guatemala. Axis of panicle glabrous.

96. P. pantrichum Hackel, Verh. Zool. Bot. Ges. Wein 1915:72. 1915. Panama to Brazil & Bolivia (Hitchcock).

97. P. stagnatile H. & C., Contr. U. S. Nat. Herb. 17:528, f. 141. 1915. Mexico and Central America (Hitchcock).
Guatemala, Honduras, Panama.
Nicaragua, Dept. Zelaya, Limbaika, Seymour 4921 (VT).

98. P. grande H. & C., Contr. U. S. Nat. Herb. 17:529, f. 143. 1915. Central America to Brazil (Hitchcock). Honduras, Nicaragua, Costa Rica, Panama, Trinidad, n. S. A. Specimens not seen.

99. P. Tuerckheimii Hackel, Allg. Bot. Zeitschr. 12:60. 1906. Spikelets and fruit glabrous.
Mexico, British Honduras, Guatemala.

100. P. incumbens Swallen, Contr. U. S. Nat. Herb. 29: 417. 1950. Nodes hairy. Known only from Guatemala.

101. P. hirtum Lam., Encycl. 4:741. 1798.
Axis of panicle with long spreading hairs.
Mexico, British Honduras, Trinidad, n. S. A.
Nicaragua, Comarca del Cabo, Cororia Bush, Seymour 3760 (VT).
Waspan, Atwood 3546 (ENAG, SEY, SMU, BM, GH, F. MO, UC).
Waspan, Seymour 4664 (NY, WDP, MICH, MSU, B).

102. P. zizanioides HBK., Nov. Gen & Sp. 1:100. 1816.
S. Mexico, Greater Antilles to n. Argentina.
Guatemala, Costa Rica, Panama (FLAS).
Nicaragua, Dept. Zelaya, El Recreo, Peterson A9 (ENAG).
Limbaika, Seymour 4927 (ENAG, SEY, SMU, BM, GH, F, MO, UC, NY, WDP, WIS).

103. P. parcum H. & C., Contr. U. S. Nat. Herb. 15:68. 1910. Mexico (FLAS), Guatemala, Nicaragua (Swallen).

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Swallen, J. R., New Grasses from Mexico, Central America and Surinam, Contr. U. S. Nat. Herb. 29:395-428. 1950.

Chase, Agnes, Manual of Grasses of the United States. 1950.

Swallen, J. R., Grasses of Guatemala, Fieldiana 24: part II, 1-390. 1955.

STATISTICAL SUMMARY of PANICUM in this article.

Number of species previously known in Nicaragua	32
Number of species new to Nicaragua	16
Total number of species known in Nicargua	48
Number of additional species known in other parts of Central America	55
Total number of species known in Central America	103

ABBREVIATIONS which may not be already familiar.

AMN, Atwood, John T., Jr., Steven A. Marshall and David A. Neill, collectors.

Bth., Bentham

C. & S., Chamisso & Schlechtendal

F. T. Hubb., F. Tracy Hubbard

H. & C., Hitchcock & Chase

R. & P., Ruiz & Pavon

R. & S., Roemer & Schultes

S. A., South America

W. I., West Indies

INDEX

to species and synonyms of PANICUM in Central America. Numbers refer to pages in the Key except that the last number refers to the Annotated List.

INDEX

A NEW MEXICAN MALAXIS

Louis O. Williams

Malaxis pollardii L. Wms. sp. nov.

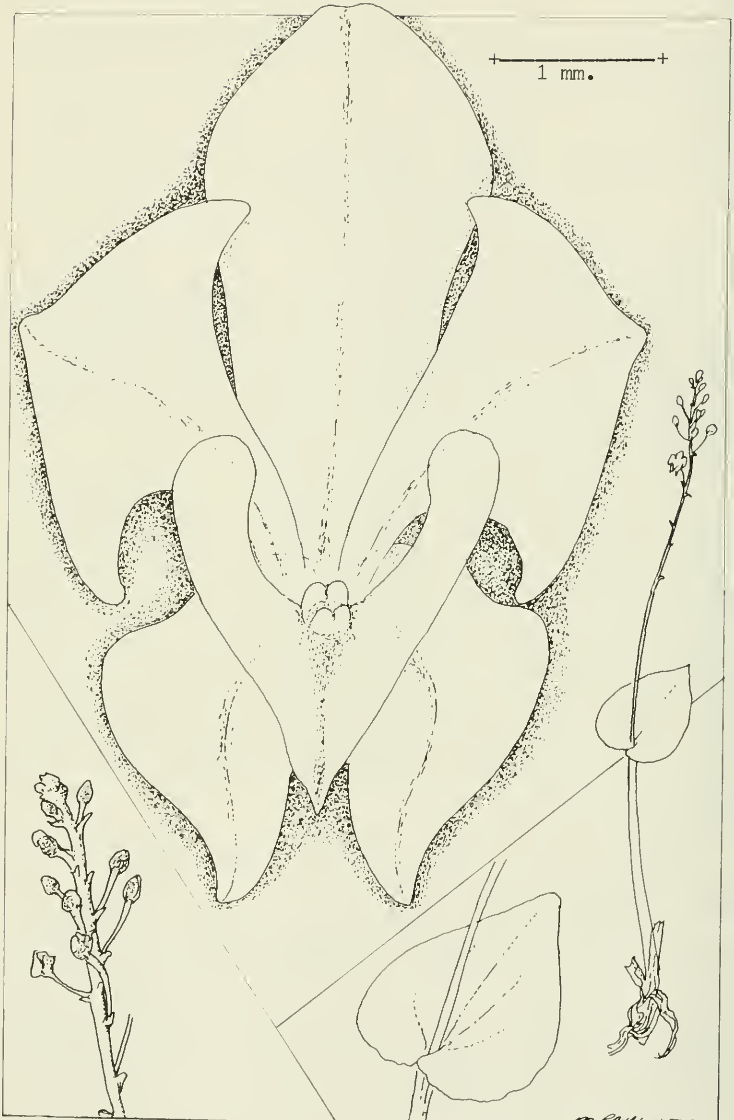
Herbae perparvae terrestres unifoliatae usque ad 11 cm. altae. Folia late ovato-cordata acuta; inflorescentiae racemosae longe pedunculatae; flores parvi virides; sepalum dorsale elliptico-ovatum acutum uninervium; sepala lateralia asymmetrica late ovata obtusa; petala dolabriformia subtrilobata uninervia; labellum trilobatum, lobus terminalis anguste triangularis, lobi laterales oblongo-lineares obtusi; columna generis.

Very small terrestrial herbs to about 11 cm. tall; stems about 4-5 cm. long with a single sessile, deeply cordate leaf; leaf broadly ovate-cordate, acute, 20-27 mm. long and 16-22 mm. broad; inflorescence a long pedunculate, several-flowered simple raceme to about 7 cm. long; flowers small, greenish, each flower subtended by a cucullate, ovate bract about 1 mm. long, pedicels slender, about 5 mm. long; dorsal sepal elliptic-ovate, acute, 1-nerved, about 3.5 mm. long and 1.5 mm. broad; lateral sepals asymmetric and broadly ovate, obtuse, about 2 mm. long and 1.5 mm. broad; petals dolabriform, subtrilobate, uninerved, about 2.5 mm. long and as broad across the lateral dolabriform lobes; lip trilobate, about 1.5 mm. long and 2.5 mm. across the extended lateral lobes, the apical lobe narrowly triangular, the narrowly oblong-linear basal lobes erect, obtuse, about 1 mm. long; column minute.

Mexico: Ofelio, Cerro San Felipe, Oaxaca, August 22, 1970, Glenn E. Pollard M-112 (type, F).

One of the smallest of the Mexican species of *Malaxis* and somewhat related to *Malaxis majanthemifolia* Schlecht. & Cham. It is easily distinguished from all of the species that I know by the dolabriform petals which remind one of the petals in some species of *Lepanthes*. The curious petals, along with the single, cordiform leaf, the racemose inflorescence and the erect lateral lobes of the lip will help to distinguish it. The collector, for whom the species is named, is one of the most active students of the Mexican orchid flora.

The illustration was drawn from the type and from photographs provided by the collector. Miss Marion Pahl is the artist.



Malaxis pollardii; a flower from photograph much enlarged; a plant slightly reduced; a leaf slightly enlarged; an inflorescence about X2.

EMILIA FOSBERGII, A NEW SPECIES.

Dan H. Nicolson
Department of Botany, Smithsonian Institution

The genus *Emilia* is paleotropical with about 45 species. All neotropical specimens of *Emilia* studied by the author (F, GH, K, L, MO, NY, US) were referable to three species. One species, *E. coccinea* (Sims) G. Don from eastern Africa, is only rarely collected as an escape from gardens at relatively high elevations (1-2000 m) or latitudes. This species has orangish-red flowers which are only half enclosed by the involucre, entire or partially shallowly dentate leaf margins, and elongate corolla lobes 1.7-2.1 mm long.

The second species, *E. sonchifolia* (L.) DC. ex Wight from South Asia, is commonly collected in lowlands (0-1000 m). This species has light purple flowers which are completely enclosed in the involucre, strongly lyrate lower leaves, and short corolla lobes 0.5-0.7 mm long.

The third and most frequently collected species, here first recognized as distinct from all previously described species, is commonly collected at middle elevations, 100-1500 m. This species has red flowers which are three-quarters enclosed by the involucre, coarsely dentate leaves, and corolla lobes 1.2-1.4 mm long.

This taxon passed in the early literature under the name *Emilia coccinea* or its synonyms, i.e., it was identified with an African species. For example, all specimens cited by Baldwin in his paper on the cytology of neotropical *Emilia* (Bull. Torrey Bot. Club 73: 18-23. 1946) as *E. coccinea* are *E. fosbergii* (except one, *Baldwin 4578*, which is *E. coccinea*).

A major change occurred when Fosberg (Univ. Hawaii, Occas. Papers 46: 14. 1948) identified red-flowered Hawaiian collections with *Emilia javanica* (N. Burm.) C.B. Robinson. Fosberg was challenged by Koster (Blumea 7: 290. 1952) who pointed out that the Hawaiian red-flowered element does not occur in Java. Fosberg (Occas. Papers Bishop Mus. 23: 136. 1966) reported discovery of Burman's types in Geneva and maintained his earlier identification while suggesting that Burman's description was incorrect in its flower color and locality. This amounts to identifying the neotropical taxon with a South Asian taxon because the Hawaiian and neotropical materials are of the same taxon. Recently this identification has entered the neotropical literature (Vuilleumier, J. Arnold Arb. 50: 122. 1969, and Adams, Fl. Pl. Jamaica 757. 1972).

The present author stepped into this quagmire in early 1974 while innocently identifying a drawing of an *Emilia* sent by Ms. Penny Honeychurch of Roseau, Dominica. Dr. F. Raymond Fosberg was able to show me, a non-asterologist, how to identify neo-

tropical specimens of Emilia in three minutes. I was astonished to find that no one had clearly elucidated these three taxa and suggested a joint paper. After annotating many specimens from the neotropics as E. javanica, I made a second error, investigating what were the taxa in South Asia and the Pacific Islands. These studies have not been concluded but those who have taken an interest in the affair, F.R. Fosberg, C. Jeffery and C.D. Adams, have joined me in agreeing that the binomial E. javanica does not pertain to the neotropical taxon.

L.O. Williams' kind invitation to contribute Emilia for the Flora of Guatemala prompts the validation of a name for this previously unrecognized but commonly collected taxon. It is a pleasure to name the species in honor of my colleague, Francis Raymond Fosberg, who has had such a substantive part in the recognition of the taxon.

EMILIA FOSBERGII Nicolson, sp. nov.

Emilia coccinea sensu auctt., non (Sims) G. Don: Britton & Wilson, Sci. Survey Porto Rico & Virgin Isl. 6: 321. 1926; Baldwin, Bull. Torrey Bot. Club 73: 18. 1946; Gooding et. al., Fl. Barbados 436. 1965 (fig. 27, mislabelled E. sonchifolia, is this species).

Emilia sagittata sensu auctt. pro parte, non DC.: Standley, Field Mus., Bot. 18: 1454. 1938; Alain, Fl. Cuba 5: 239. 1962.

Emilia javanica sensu auctt., non (N. Burm.) C.B. Robinson: Fosberg, Occas. Papers Bishop Mus. 23: 136. 1966; Vuilleumier, J. Arnold Arb. 50: 122. 1969; Adams, Fl. Pl. Jam. 757. 1972.

Folia grosse dentata, 8-13 X 3-5 cm, inferiora petiolata, spathulata, superiora sessilia, sagittata. Pedunculi terminali, 15-30 cm longi, in 2-4 capitula terminans. Involucrum 11-15 mm longum, bracteis ca 7. Flosculi ca 50. Corollae typice latericiae, 9-10 mm, involucra ca 2-3 mm excedens, lobis corollarum 1.1-1.4 mm longis. Stamen cum parte superiora filamenti crassata, 0.5 mm longa, thecis 1.5-1.6 mm longis, appendiculis antherorum 0.3-0.4 mm longis. Achenia 4.0 X 0.6 mm longa, costulis intermediis inter sulcis interne puberulentibus sed non per colore differentibus.

Holotype: Bahamas, New Providence, near Nassau, 26 Dec. 1902, A. H. Curtiss 6 (US-428506). Isotypes: F, GH, MO, NY, US.

Paratypes (all in F, GH, MO, NY, and US): U.S.A., Florida, Lee County, vicinity of Fort Myers, in pineland, 21 Mar. 1916, J. P. Standley 66. CUBA, Santiago Province, vicinity of Baracoa, "rays deep crimson," 24-29 Jan. 1902, C. L. Pollard et al. 17. JAMAICA, vicinity of Kingston, alt. 500 ft., 29 Jan. - 24 Feb. 1900, W. N. Clute 9. ST. CROIX, Constitution Hill, "flowers scarlet," 13 Dec. 1895. A. E. Ricksetter 150. BRAZIL, Amazonas, Manicore Municip. near Santa Fe, "flowers red," 8-11 Sep. 1934, B. A. Krukoff 6066.

BAHAMA POLYGALACEAE AND THEIR GREATER ANTILLEAN AFFINITIES -- A PRELIMINARY TREATMENT

William T. Gillis
Department of Biology
Hope College
Holland, Michigan 49423

Polygala is one of the great taxonomic and nomenclatural horrors among West Indian plants. It not only is reported to have apomictic forms (Long and Lakela, 1971), and possibly has species which hybridize, but also demonstrates great variation in vegetative morphology. It is this latter trait which has led splitters among workers in the past to overdescribe taxa in West Indian members of the genus.

In an effort to unravel taxonomic and nomenclatural problems in *Polygala* for the Bahama flora which Mr. George R. Proctor and I are revising, I have made study among the *Polygala* species known from the Bahamas and adjacent regions, working largely with herbarium material. Most of the study has been carried out at the Field Museum of Natural History where I have examined the extensive and classic collections of N.L. Britton, C.F. Millspaugh, L.J.K. Brace, Percy Wilson, and J. and A. Northrop from the Bahamas. I should like to thank Dr. L.I. Nevling, Jr., Chairman of the Botany Department at the Field Museum together with other administration and staff personnel, for making these collections available to me. Furthermore, I acknowledge with appreciation curators and directors of the Gray Herbarium and Arnold Arboretum of Harvard University, the United States National Herbarium and the New York Botanical Garden Herbarium for the loan of specimens. Especially important have been specimens including types seen by S.F. Blake, who monographed U.S. and West Indian *Polygala* (1916) and who revised *Polygala* for the *North American Flora* (1924). I should also like to acknowledge with appreciation travel funds granted by Hope College for visits to herbaria in undertaking this study. Thanks are due Drs. John H. Beaman, Norton G. Miller, and Paul Van Faasen for their critical review of the manuscript and for helpful suggestions for its improvement.

J.K. Small contributed the treatment of *Polygala* in Britton and Millspaugh's Bahama flora (1920). One might infer that he also influenced their use of the segregate genus *Badiera* for the one woody member of the alliance treated earlier by Blake (1916) as *Polygala oblongata*. Britton (1907, 1910) also revised the genus *Badiera*. As was common during that period of taxonomic history, no infraspecific categories were recognized; when a morphological segregate was found in an archipelago like the Bahamas, it was likely to be described as a new species, rather than being considered to be a form of a more wide-ranging species.

Small's treatment of *Polygala* for the Bahama flora (1920) consisted of six species (including *Badiera*). Herein, five of these are treated under different names from those in Bahama flora (ibid.) including one new combination. Other new combinations are made herein for related taxa occurring on islands in the Greater Antilles.

KEY TO *POLYGALA* IN THE BAHAMAS

A. Plants shrubby; calyx lobes unequal but all free; keel without a beak...........1.(Subg. *Badiera*) *Polygala penaea* (see key to subspecies below).
A. Plants herbaceous; calyx lobes uniform; keel with or without a beak or crest...........B.

B. Leaves alternate; keel without a beak or crest; abaxial sepals connate...........2.(Subg. *Habeclada*) *Polygala grandiflora* var. *angustifolia*.
B. Leaves verticillate; keel with a 2-many-lobed crest; abaxial sepals free...........(Subg. *Polygala*)...C.

C. Leaves in whorls of 4, 2-6 mm wide, 3.5-7.5 mm long...D.
C. Leaves in whorls of 2-3, 1.5-2.5 mm wide, 8 - 17 mm long...........4.*Polygala spathulata*.

D. Capsule about as broad as long; lowermost leaves elliptic-obovate, often mucronate; upper blades linear; $2n = 28$...3a.*Polygala boykinii* var. *boykinii*.
D. Capsule manifestly longer than broad; lowermost leaves subulate to linear or linear-lanceolate; upper blades few; $2n = 96$...........3b. *Polygala boykinii* var. *sparsifolia*.

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Polygala penaea L. Sp. Pl. 2: 703. 1753.

KEY TO SUBSPECIES OF *POLYGALA PENAEA*

A. Leaves scabrous, papillose above and below, fruit hispidulous or pilosulous..........1a.*Polygala penaea* L. subsp. *penaea*.
A. Leaves glabrous to glabrate, not rough to the touch; fruit glabrous to appressed-strigillose or pubescent chiefly on the margin...........B.

B. Leaves less than 5 mm broad...........1d.*Polygala penaea* subsp. *guantanamana*.
B. Leaves more than 7 mm broad...........C.

C. Leaves lustrous on upper surface, revolute.........
..1c.*Polygala penaea* subsp. *portoricensis*.
C. Leaves glabrous or glabrate on upper surface, not lustrous; leaves plane...........1b.*Polygala penaea* subsp. *oblongata*.

1a. *Polygala penaea* L. subsp. *penaea*
P. penaea L. Sp. Pl. 2: 703. 1753. *Badiera penaea* (L.) DC., Prodr. 1: 335. 1824. Type: Habitat in America America meridionali. Lectotype: LINN (not seen).

Polygala domingensis Jacq., Sel. Stirp. Pict. 96. 1780. *Badiera domingensis* (Jacq.) DC., Prodr. 1: 335. 1824. Type: unknown.

This is the form found in Hispaniola, both in Haiti and in the Dominican Republic. It differs from other subspecies by its scabrous, broad leaves.

1b. *Polygala penaea* subsp. *oblongata* (Britton) Gillis, comb. et stat. nov.

Basionym: *Badiera oblongata* Britton, Bull. N.Y. Bot. Gard. 5: 314. 1907. *Polygala oblongata* (Britton) Blake, Contr. Gray Herb. 47: 13. 1916. Type: *Britton & Brace 578*, Bahama Islands, New Providence Island, north slope of Blue Hills. Holotype: NY; Isotypes: F-185945; US-655924, US-758265.

Polygala dimorphophyllum Blake, Contr. Gray Herb. 47: 16. 1916. *Badiera heterophylla* Britton, Bull. Torrey Bot. Club 42: 496. 1915, non *Polygala heterophylla* Scheele, Linnaea 17: 336. 1843. Type: Cuba, Oriente Province, deciduous woods, Sierra Nipe near Woodfred. 450-550 m. elevation. *Shafer 3070*. Holotype: NY; Isotype: US-792308.

Polygala punctifera Blake, Contr. Gray Herb. 47: 13. 1916. *Badiera punctata* Britton, Bull. Torrey Bot. Club 42: 496. 1915, non *Polygala punctata* A.W. Benn., J. Bot. 17: 172. 1879. Type: Cuba, Oriente Province, near streams, Arroyo del Medio above the falls. *Shafer 3644*. Holotype: NY; Isotype: US-792655.

Polygala diversifolia f. *elliptica* Chodat, Monogr. 2: 10. 1893. Type: *Wright 1914*, pro parte.

Polygala diversifolia f. *obovata* Chodat. Monogr. 2: 11. 1893. Type: *Wright 1914*, pro parte.

The present treatment recognizes the Cuban and Bahaman populations of this woody *Polygala* to be geographic subspecies of the inclusive and widespread Greater Antillean *P. penaea*. The only major difference from typical *P. penaea* is the lack of pubescence on the leaves and fruits in subsp. *oblongata*. It seems logical that geographic isolates in Cuba and the Bahamas should differ somewhat from the populations on Hispaniola. The Bahama populations probably originated from the Cuban ones, introduced through Andros Island or onto the Great Bahama Bank during the Pleistocene at a time when sea levels were 180 meters lower than at present and all of the Great Bahama Bank was exposed. The channel separating the Bahamas and Cuba (now about 190 km.) at that time was probably about 40 km. wide, thus increasing the likelihood of occasional dispersal of seeds from Cuba to the Great Bahama Bank. Once established on the Bank, the plant dispersed throughout the islands. As a geographic variant, this taxon is treated as a subspecies of *P. penaea*, the oldest name.

1c. *Polygala penaea* subsp. *portoricensis* (Britton) Gillis, comb. et stat. nov.

Basionym: *Badiera portoricensis* Britton, Bull. Torrey Bot. Club 42: 494. 1915. *Polygala portoricensis* (Britton) Blake, Contr. Gray Herb. 47: 14. 1916. Type: Puerto Rico, Guanajibo, near Mayaguez. *Britton, Cowell & Brown 4349*. Holotype: NY; Isotype: US-791496.

This Puerto Rican subspecies differs from the typical stock on Hispaniola in having a lustrous upper leaf surface, revolute leaves, and glabrous fruits. Flowers and fruits are indistinguishable from Cuban and Bahaman forms. Because there are so few differences between this form and typical *Polygala penaea*, it seems appropriate to reduce this taxon to a subspecies of *P. penaea*.

1d. *Polygala penaea* subsp. *guantanamana* (Blake) Gillis, comb. et stat. nov.

Basionym: *Polygala guantanamana* Blake, Contr. Gray Herb. 47: 12. 1916. *Badiera virgata* Britton, Bull. Torrey Bot. Club 37: 361, 1910, non *Polygala virgata* Thunb., Fl. Cap. (Africa). Type: Cuba, U.S. Naval Station, Guantanamo Bay. *Britton 2086*. Holotype: NY; Isotype: US-658842.

This segregate from southeastern Cuba differs only in having narrower leaves than those of the other subspecies, but otherwise, it has similar flowers and fruits.

2. *Polygala grandiflora* Walt. var. *grandiflora*.

Basionym: *Polygala grandiflora* Walt., Fl. Car. 179. 1788. The type of Walter's *Polygala grandiflora* should be at the British Museum (Natural History). It has not been seen. Because populations in the Bahamas represent -- in my opinion -- a different variety, attention will be given to synonymy only for the variety in our flora.

Polygala grandiflora var. *angustifolia* T. & G., Fl. N. Amer. 1: 671. 1840 non *P. angustifolia* H.B.K. (= *P. brizoides* St. Hil.), non Gililo, Fl. Lituan. Type: *Dr. Leavenworth, s.n* Lectotype: NY.

Polygala cubensis Chodat, Monogr. Polygal. 2: 62, t. 15, f. 36. 1893. Type: Cuba, *Wright 112*. Holotype: Not seen. Isotypes: BM, GH.

Polygala wrightii Chodat, Monogr. Polygal. 2: 67, t. 13, f. 8-9. 1893. Type: Cuba, *Wright 112*. Holotype: Not seen. Isotypes: K, BM, GH.

Polygala krugii Chodat, Monogr. Polygal. 2: 63, t. 15, f. 37-38. 1893. Type: New Providence, Bahamas. *Eggers 4450*. Holotype: Hb. Krug & Urb. at B (destroyed). Isotype: (fragment) NY.

Polygala bahamensis Blake, Contr. Gray Herb. 47: 64. 1916. Type: Bahamas, New Providence, pine region, 13.5 km. (8.5 mi.) S.W. of Nassau, 12 April 1905. *A.E. Wight 272*. Holotype: GH; Isotypes: NY, US-225463.

Polygala cumulicola Small, Bull. Torrey Bot. Club 51: 381. 1924. *Asemeia cumulicola* (Small) Small, Man. S.E. Fl., p. 766. 1933. Type: Florida, dunes opposite Miami (now = Miami Beach), *J.K. Small & G.K. Small 4568*. Holotype: NY; Isotypes: NY, US-1841792.

Polygala miamiensis Small ex Blake, N. Amer. Fl. 25: 340. 1924. *Asemeia miamiensis* (Small ex Blake) Small, Man. S.E. Fl., p. 767. 1933. Type: Florida, Everglades west of Miami, *J.K. Small & G.K. Small 289*. 9 November 1901. Holotype: NY.

Polygala corallicola Small, Bull. N.Y. Bot. Gard. 3: 425. 1905. Type: Florida, Dade Co., Miami. *Small & Nash, s.n.* Lectotype: NY.

Polygala flabellata Shuttleworth ex Gray, Pl. Wright. 1: 41. 1852, pro syn.

Polygala grandiflora var. *leptophylla* Chodat, Monogr. Polygal. 2: 57. 1893, non *Polygala leptophylla* Burch, 1822. Syntypes: Cuba, *Wright 112.* Holosyntype: Not seen; Isosyntype: GH. Dominican Republic, Sierra de Palo, Quemado, 500 m. Holosyntype: Not seen; Isosyntypes: BM, K (Not seen).

Polygala grandiflora var. *orbicularis* Chodat, Monogr. Polygal. 2: 57. 1893. Type: Dominican Republic, near Santiago to Cuesta de Piedra among grasses in calcareous soil; savanna near S. Carlon. *Preneloup 1004.* Holotype: Not seen.

Polygala grandiflora leiodes Blake, N. Amer. Fl. Polygalaceae 25: 339. 1926. *Asemeia leiodes* (Blake) Small, Man. S.E. Fl., p. 766. 1933. Type: Florida, Lee Co., Ft. Myers vicinity, in pineland. *Miss J.P. Standley 25.* Holotype: US-569482; Isotype: NY.

The whole complex of *Polygala grandiflora* needs thorough biosystematic study. Typification of *P. grandiflora* Walt. needs to be carried out in order to determine whether, indeed, varieties such as those recognized herein differ from the type of the species. Further comprehensive study of variation throughout the range of the species is also needed. In a recent treatment of Polygalaceae of southeastern United States, Saulmon (1971), has treated the entire species complex as without infraspecific taxa. Varieties have been maintained at this juncture, but without substantial reason, to avoid conflict with nearby floras and other treatments (Long and Lakela, 1971; León and Alain, 1953; Miller, 1971).

Polygala grandiflora is variable, especially in vegetative characters. As treated herein, var. *grandiflora* has leaves greater than 0.8 cm wide (at the broadest point) and var. *angustifolia* has leaves narrower than this. It is likely that there is a range of variation in the wild within one taxon which spans this gulf.

The type of *P. grandiflora* var. *angustifolia* at the New York Botanical Garden consists of four above-ground portions of plants and a 3-inch piece of lower stem and root. A handwritten label is glued over two of the former, indicating

that it is a Chapman collection from Florida. Below the two remaining specimens are the words (in a different handwriting): "Florida. Dr. Leavenworth." All specimens appear to be identical. Across the Chapman label, in Torrey's handwriting, are the words "angustifolia T. & G. Suppl. Vol. I." Someone else has later added in pencil "Evidently the two type collections of...." with an arrow pointing to the epithet. I believe that all specimens on the sheet constitute material examined by Torrey. In his publication, he gives the following citation: "Southern Florida, Dr. Leavenworth! Middle Florida, Dr. Chapman." Because of the association of the exclamation point (!) with the Leavenworth specimen, I believe it should be considered the lectotype.

The collections of Wright from Cuba (no. *112*) "prope villam Monte Verde dictam, Cuba orientali" have served as types of three different Chodat taxa: *Polygala wrightii*, *P. cubensis*, and *P. grandiflora* var. *leptophylla*. Specimens available to Chodat have not been examined, but duplicates at the Gray Herbarium were studied. One (herein labeled "A") has a date of Jan.-Jul. 1859. A second (herein labeled "B") is marked "1856-7 in Cuba orientali." The third (herein labeled "C") is marked "1860-1864." "A" and "B" are indistinguishable to me. Blake annotated them both as *P. angustifolia* H.B.K. but they are also isotypes of both *P. cubensis* and *P. wrightii*. Blake labeled "C" as "cotype collection, *P. grandiflora* Walt. var. *leptophylla* Chod." It is odd that Blake should label this specimen as such when he cited it in his monograph (1916) as the type of *P. cubensis*. Chodat chose parts of *Wright 112* as types for both taxa, so Blake is not totally wrong. He did, however, cite this differently from the way he annotated it! In addition to the two names mentioned above, Chodat also cited *Wright 112* p.p. as *P. angustifolia* H.B.K. I have called "C" as isotype of *P. cubensis*.

That certain of these other names listed above are synonymous is not a new treatment. Blake himself (1924) recognized the synonymity of *P. krugii* and *P. bahamensis*. Long (1970) has noted that *P. corallicola* is the same as *P. grandiflora* var. *angustifolia*, etc.

The synonymy given here is to be considered only a beginning; it is far from exhaustive. My purpose has been to deal with names in Britton and Millspaugh's Bahama Flora (1920) and to try to equate them to names in use elsewhere in the northern West Indies and South Florida in order to bring more harmony to all these floras. Many more names abound. Unhappily, many of these will some day be found to apply to this complex as well.

3. *Polygala boykinii* Nutt., J. Acad. Nat. Sci. Philadelphia 7: 86. 1834.

3a. *P. boykinii* Nut. var. *boykinii*. Type: *Boykin, s.n.* Georgia. Holotype: PH.

Polygala bicolor Hook., J. Bot. 1: 194. 1834. Lectotype: K.

Polygala wilsonii Small in Britt. & Millsp., Bahama Flora, p. 216. 1920. Type: Bahama Islands, Cay Sal Bank, Anguilla Cays, *Wilson 8030*. Holotype: NY; Isotypes: A, F-246435, NY.

The typical variety of *Polygala boykinii* is found in the Bahamas only on the Cay Sal Bank where it was collected by Percy Wilson in 1909. It was described as new in the Bahama flora, but I have interpreted this collection as quite typical *P. boykinii*, having compared it to the type of the species at the Philadelphia Academy of Natural Sciences.

Although it may be shown that the taxa in this complex have distinct geographical ranges, I have chosen to recognize them at varietal rank for the moment. Inasmuch as this is a preliminary treatment, I see no point in making mass transfers to subspecies when I have no evidence for their having a distinct geographical range. In his treatment of Polygalaceae in the southeastern United States, Saulmon (1971) has considered no infraspecific taxa within this species.

3b. *Polygala boykinii* var. *sparsifolia* Wheelock, Mem. Torrey Bot. Club 2: 121. 1890. *Polygala sparsifolia* (Wheelock) Small, Fl. S.E. U.S., p. 686. 1903. Type: *A.H. Curtiss 503*, Florida, Cudjoe Key. Holotype: NY; Isotypes: US-7893, NY.

Polygala praetervisa Chodat, Monogr. Polygal. 2: 140. 1893. Type: *A.H. Curtiss 503*. Florida, Cudjoe Key. Holotype: Not seen. Isotypes: NY (2), US-7893.

Polygala flagellaris Small, Bull. N.Y. Bot. Gard. 3: 427. 1905. Type: Florida, Dade Co., pinelands near the Homestead Road between Cutler and Camp Longview. *J.K. Small & J.J. Carter 1078*. Holotype: NY.

Polygala wightiana Blake, Contr. Gray Herb. 47: 88. 1916, non *P. wightiana* Wall. ex Wight & Arnott, Prodr. Fl. Pen. Ind. Or. I: 36. 1834. Type: Bahama Islands, New Providence Island, Adelaide, border of marsh in loamy sand and honeycomb limestone, 21 km. (13 miles) southwest of Nassau. *A.E. Wight 79*. Holotype: GH; Isotypes: F-225262, NY.

This variety has a number of distinctive characters that separate it from the typical variety. The two differ in size and proportions of the capsule, the shape of the lower leaves, and density of upper leaves, and in chromosome number (Lewis and Davis, 1962).

The typical variety has leaves along the stem of the inflorescence. The lowermost leaf blades are elliptic to obovate, often mucronate at the tip and grade into linear leaves toward the apex. The capsule is nearly as broad as long. Lewis and Davis (1962) have found the chromosome number to be $2n = 28$.

Chodat (1893) and Wheelock (1891) chose duplicates of the same collection as types of the two names *Polygala praetervisa* and *P. boykinii* var. *sparsifolia*, respectively. Although Chodat's material has not been seen, it is likely that this is not a mixed collection, but rather that the two workers chose portions of the same gathering coincidentally, both recognizing it as different from previously-known taxa.

On the other hand, variety *sparsifolia* has few leaves below the inflorescence. All leaves are more or less linear or linear-lanceolate. The chromosome number is $2n = 96$, (Lewis and Davis, 1962), a likely polyploid with aneuploidy. It is possible that this form is apomictic.

In the Bahamas *P. boykinii* var. *sparsifolia* is distributed throughout the archipelago, probably having migrated there from South Florida where its congeners are.

4. *Polygala spathulata* Griseb. Cat. Pl. Cub. 13. 1866. Type: Cuba, San Juan de Buenavista, banks among tall grass in savannas. *Wright 1910*. Holotype: GOET (Not seen); Isotypes: BM, GH, K.

This species of the Greater Antilles and the Bahamas remains nomenclaturally unchanged from the Bahama Flora (1920). It is found on islands of the Great and Little Bahama Banks, probably having crossed from Cuba during low-water stages of the Pleistocene when Andros and Cuba were less than 40 km. apart. It is a small, tufted plant, often overlooked in the essentially woody flora of the Bahamas.

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NOMENCLATURAL NOTES ON *HIERACIUM (COMPOSITAE)* IN GUATEMALA

John H. Beaman

Michigan State University, East Lansing 48824

For several years I have had in progress a revision of the Mexican and Central American species of *Hieracium*. Although the study is nearly ready for publication, it appears that the *Compositae* for the *Flora of Guatemala* will be published before my revision. Dr. Louis Williams and Ms. Dorothy Nash have therefore requested that the nomenclatural changes in *Hieracium* which will affect the *Flora* be made in advance of its publication. These changes are:

HIERACIUM FENDLERI Sch. Bip. subsp. *OSTREOPHYLLUM* (Standl. & Steyerm.) Beaman, comb. et stat. nov. *H. ostreophyllum* Standl. & Steyerm., Field Mus. Bot. Ser. 23: 104. 1944. Two subspecies are recognized, which may be distinguished as follows:

Involucres sparsely to densely
long-hirsute .... *H. fendleri* subsp. *fendleri*
Involucres moderately to densely pubescent with
gland-tipped hairs .... *H. fendleri* subsp. *ostreophyllum*

Hieracium fendleri subsp. *fendleri* occurs from the Black Hills of South Dakota southward into Mexico, reaching its southern limit in Michoacan; *H. fendleri* subsp. *ostreophyllum* is found in Jalisco, Mexico, and Huehuetenango and San Marcos, Guatemala.

Hieracium guatemalense Standl. & Steyerm. Field Mus. Bot. Ser. 23: 101. 1944, and *H. culmenicola* Standl. & Steyerm., ibid. 100. 1944, I consider to be a single species. My revision will recognize the name *H. guatemalense*.

Hieracium stuposum Fries, Vet.-Akad. Förh. 146. 1856 (*non H. stupposum* Reichb. 1831), is apparently the earliest name for the species described as *H. pringlei* A. Gray, Proc. Amer. Acad. 19: 69. 1883, and *H. jaliscense* Robins. & Greenm., Proc. Amer. Acad. 40: 23. 1904, including also several infraspecific names under the latter which will be considered synonyms.

NOTES ON NEW AND NOTEWORTHY PLANTS. LXXXII

Harold N. Moldenke

CLERODENDRUM INERME f. PARVIFOLIUM Moldenke, f. nov.

Haec forma a forma typica speciei laminis foliorum semper parvioribus plerumque 2—4 cm. longis 1—2 cm. latis recedit.

This form differs from the typical form of the species in having its leaf-blades on the flowering and/or fruiting branches or branchlets uniformly smaller, usually only 2—4 cm. long and 1—2 cm. wide.

The type of the form was collected by N. Wirawan (no. 683) in a rocky area near the Smithsonian Camp, Patanagala, Ruhuna National Park, Hambantota District, Sri Lanka, on October 28, 1968, and is deposited in the Britton Herbarium at the New York Botanical Garden.

CLERODENDRUM LANKAWIENSE var. ANDAMANENSE Moldenke, var. nov.

Haec varietas a forma typica speciei laminis foliorum perfecte ellipticis 6—25 cm. longis 2—10 cm. latis ad apicem basimque acutis vel ad apicem paullo subacuminatis et minutissime apiculatis et calicibus extus glandulis peltatis ornatis recedit.

This variety differs from the typical form of the species in having its leaf-blades perfectly elliptic, 6—25 cm. long, 2—10 cm. wide, acute at both ends or slightly subacuminate and very minutely apiculate at the apex and the calyx in anthesis conspicuously marked with crateriform glands on the outside surface.

The type of this variety was collected by Sulpiz Kurz at North Corbyna Cove, South Andaman island, Andaman Islands, and is deposited in the herbarium of the Botanische Staatssammlung in Munich.

CLERODENDRUM TERNATUM f. GLABRICALYX Moldenke, f. nov.

Haec forma a forma typica speciei calicibus semper glaberrimis recedit.

This form differs from the typical form of the species in having its calyx, both in flower and in fruit, completely glabrous.

The type of the form was collected by H. Merzmüller (no. 502) on northerly exposed slopes, along a stream, at Olifantsrivier, Krüger National Park, Transvaal, South Africa, on December 2, 1951, and is deposited in the herbarium of the Botanische Staatssammlung at Munich.

CLERODENDRUM TRIPHYLLUM f. ANGUSTISSIMUM Moldenke, f. nov.

Haec forma a forma typica speciei foliis regulariter angustissimis numerosis anguste oblongo-ellipticis 3—5 cm. longis 2—4 mm. latis ad apicem argute acutis plerumque calloso-mucronulatis recedit.

This form differs from the typical form of the species in having its very numerous leaves regularly much narrower and quite

uniform, narrowly oblong-elliptic, 3—5 cm. long, 2—4 mm. wide, regularly tapering to the very sharply acute and mostly callose-mucronulate apex.

The type of the form was collected by T. J. Jenkins in the Boekenhouts valley, probably in Pretoria district, Transvaal, South Africa, on December 18, 1910, and is deposited in my personal herbarium at Plainfield, New Jersey.

GMELINA ASIATICA f. LOBATA Moldenke, f. nov.

Haec forma a forma typica speciei laminis foliorum plusminusve trilobatis recedit.

This form differs from the typical form of the species in having its leaf-blades more or less 3-lobed.

The type of the form was collected by N. Wirawan, R. G. Cooray, and N. Balakrishnan (no. 899) at the Smithsonian Camp, Marai Villu, Wilpattu National Park, Sri Lanka, on June 30, 1969, and is deposited in the Britton Herbarium at the New York Botanical Garden.

LEIOTHRIX UMBRATILIS var. BREVIPES Moldenke, var. nov.

Haec varietas a forma typica species pedunculis ad anthesin 5—12 cm. longis recedit.

This variety differs from the typical form of the species in having its peduncles during anthesis and fruit only 5—12 cm. long.

The type of the variety was collected by Bogner (no. 1017) on the cumbre of Auyan-tepui, at 2400 meters altitude, Bolívar, Venezuela, on February 25, 1975, and is deposited in the herbarium of the Botanische Staatssammlung at Munich.

PAEPALANTHUS KARSTENII var. SUBSESSILIS (Moldenke) Moldenke, stat. nov.

Paepalanthus subsessilis Moldenke, Phytologia 2: 232—233. 1947.

PAEPALANTHUS LODICULOIDES var. FLOCCOSUS Moldenke, var. nov.

Haec varietas a forma typica speciei pilis floccosis perdensissimis albis folios plerumque sub anthesin aequantibus vel superantibus recedit.

This variety differs from the typical form of the species in having the tuft of white hairs at the apex of the stems extremely dense, cottony, glistening white, and conspicuous and usually equaling or surpassing the terminal leaves.

The type of the variety was collected by Antoine M. Cleef, José Cuatrecasas, and Roberto Jaramilla Mejía (no. 9214) on the Páramo de la Sarna, between Sogamoso and Vado Hondo, 5 km. northeast of Laguna de Tota, Boyacá, Colombia, at 3500 meters altitude, on March 30, 1973, and is deposited in the herbarium of the Instituto de Ciencias Naturales of the Universidad Nacional de Colombia, Bogotá, Colombia. The collectors describe the type locality as "Vertiente seco poco húmido, con Oreobolus obtusangulus,

Rhynchospora paramorum, Espeletia congestiflora y Xyris acutifolia. Suelo arenoso. Hierba arrosetada."

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ADDITIONAL NOTES ON THE GENUS CITHAREXYLUM. IX

Harold N. Moldenke

CITHAREXYLUM B. Juss.

Additional bibliography: Spach, Hist. Nat. Veg. Phan. 9: 227. 1840; Janssonius, Mikrogr. Holz. Jav. 754. 1926; Rohweder, Farinos. Veg. Salv. 4 [thesis]. 1954; Rohweder, Abhandl. Geb. Ausl. Univ. Hamb. 61 [C Naturwiss. 13]: 4. 1956; Gibbs, Chemotax. Flow. Pl. 3: 1752—1755. 1974; Moldenke, Phytologia 31: 448—462. 1975; Molina R., Ceiba 19: 95. 1975.

Gibbs (1974) reports saponins and tannins absent from this genus or, in the former chemical, "probably absent".

CITHAREXYLUM BERLANDIERI B. L. Robinson

Additional bibliography: Gibbs, Chemotax. Flow. Pl. 3: 1753 & 1754. 1974; Moldenke, Phytologia 31: 339—341, 394, & 458. 1975.

Gibbs (1974) reports cyanogenesis absent from the leaves of this species, syringin doubtfully absent from its stems, and the HCl/methanol test giving negative results.

Herbarium material has been misidentified and distributed in some herbaria as C. caudatum L.

Additional citations: MEXICO: Tamaulipas: Taylor & Taylor 7250 (N).

CITHAREXYLUM BRACHYANTHUM (A. Gray) A. Gray

Additional bibliography: Moldenke, Phytologia 31: 341—342, 393, & 394. 1975.

The Smith, Peterson, & Tejeda 4121, distributed as C. brachyanthum, is actually C. racemosum Sessé & Moc.

CITHAREXYLUM CAUDATUM L.

Additional & emended bibliography: Little, Woodbury, & Wadsworth, U. S. Dept. Agr. Agric. Handb. 449 [Trees P. R. & Virg. Isls. 2]: 854, 858, 990, & 1000. 1974; Moldenke, Phytologia 31: 343—347, 351, 352, 359, 393, 394, & 459. 1975; Molina R., Ceiba 19: 95. 1975.

Little describes the bark of this species as gray and slightly fissured and reports the vernacular name, "péndula de sierra", from Puerto Rico.

The Taylor & Taylor 7250, distributed as C. caudatum, is actually C. berlandieri B. L. Robinson.

Additional citations: PUERTO RICO: E. L. Little 16315 (W—2750089).

CITHAREXYLUM ELLIPTICUM Sessé & Moc.

Additional bibliography: Gibbs, Chemotax. Flow. Pl. 3: 1752—1755. 1974; Moldenke, Phytologia 31: 353 & 454. 1975.

Gibbs (1974) reports cyanogenesis and leucoanthocyanin absent from the leaves of this species, tannin probably absent, and syringin absent from the stems, while the Ehrlich test gives negative results in the leaves and the Juglone test negative results (but blue fluorescence) in the bark.

CITHAREXYLUM FRUTICOSUM L.

Additional & emended bibliography: Little, Woodbury, & Wadsworth, U. S. Dept. Agr. Agric. Handb. 449 [Trees P. R. & Virg. Isls. 2]: 854, 990, & 1000. 1974; Moldenke, Phytologia 31: 448—453, 457, & 459. 1975.

Little and his associates (1974) consider C. pentandrum Vent. as a synonym of C. fruticosum, but, having examined the type collection of Ventenat's plant, I cannot agree to this; at least, not to the typical form of C. fruticosum!

The Correll 43327, distributed as C. fruticosum, is actually better placed as var. subvillosum Moldenke.

CITHAREXYLUM FRUTICOSUM var. SUBVILLOSUM Moldenke

Additional bibliography: Moldenke, Phytologia 31: 451—452. 1975.

Correll describes this plant as a large shrub, 2.5 m. tall, and found it growing in coppices, flowering in August. Correll 43327 is said to have had white corollas.

Additional citations: TURKS AND CAICOS ISLANDS: North Caicos: Correll 43327 (N).

CITHAREXYLUM FRUTICOSUM var. VILLOSUM (Jacq.) O. E. Schulz

Additional bibliography: Janssonius, Mikrogr. Holz. Jav. 754. 1926; Moldenke, Phytologia 31: 452—453, 459, & 462. 1975.

CITHAREXYLUM HEXANGULARE Greenm.

Additional bibliography: Moldenke, Phytologia 31: 454. 1975; Molina R., Ceiba 19: 95. 1975.

CITHAREXYLUM HIRTELLUM Standl.

Additional bibliography: Moldenke, Phytologia 31: 455—456. 1975; Molina R., Ceiba 19: 95. 1975.

Molina R. (1975) records this species from Honduras, but probably the plant to which he is referring will prove to be C. cooperi Standl.

CITHAREXYLUM KUNTHIANUM Moldenke

Additional bibliography: Moldenke, Phytologia 31: 461—462. 1975.

The Delgado 201, previously cited by me as C. kunthianum, appears, instead, to be C. subflavescens Blake.

CITHAREXYLUM LAETUM Hieron.

Additional bibliography: Moldenke, Phytologia 31: 462. 1975.

It should be noted here that the second Angely reference in the bibliography of this species (1971) is dated "1970" on its title-page, but was not actually published until 1971.

CITHAREXYLUM LANKESTERI Moldenke

Additional bibliography: Moldenke, Phytologia 13: 295. 1966; Moldenke, Résumé Suppl. 17: 8. 1968; Moldenke, Fifth Summ. 1: 84, 87, 90, & 433 (1971) and 2: 859. 1971; Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 93, 101, & 145. 1973; Moldenke, Phytologia 31: 345. 1975.

Recent collectors describe this plant as a small tree, 7.5—15 m. tall, the trunk 10—26.5 cm. in diameter at breast height, the flower racemes [or "spikes"] pendent, and the fruit abundant, green, then turning bright-yellow and finally red when mature, subglobose, fleshy or succulent, slightly flattened laterally, the fruiting-calyx persisting on the old fruit-axis or rachis. Madríz says that the fruit is borne "en racimos colgantes".

The species has been found growing in open meadows with relics of montane forest and in the cloudforest region on mountains, at altitudes of 2000—2800 meters, flowering in March and October and fruiting from January to March and in June. Fosberg describes it as "common in forest filling deep ravine in pasture", while Stern & Chambers tell us that it is "of fairly common occurrence" in Chiriquí, Panama. The vernacular name, "dama", is reported for it. The corollas were "white" on F. R. Fosberg 43269. Gibson (1970) reduces the species to the synonymy of C. mocinni D. Don.

Material has been misidentified and distributed in some herbaria as C. mocinni D. Don. On the other hand, the Hatheway & Schnell 1480, distributed as C. lankesteri, is C. mocinni.

Additional citations: HONDURAS: Morazán: Williams & Molina R. 13703 (Ba). EL SALVADOR: Chalatenango: Tucker 1049 (Ba). COSTA RICA: Heredia: Lems s.n. [Jan. 29, 1964] (N). San José: F. R. Fosberg 43269 (W—2680812); Madríz V. 40 (N). PANAMA: Chiriquí: Stern & Chambers 98 [Yale wood no. 51603] (E—1739983).

CITHAREXYLUM LAURIFOLIUM Hayek

Additional & emended bibliography: Prain, Ind. Kew. Suppl. 4, imp. 1, 49 (1913) and 4, imp. 2, 49. 1958; R. C. Foster, Contrib. Gray Herb. 184: 169. 1958; F. J. Macbr., Field Mus. Publ. Bot. 13 (5): 669, 670, 676—677, & 680. 1960; Moldenke, Phytologia 13: 295. 1966; Moldenke, Fifth Summ. 1: 140, 181, & 429 (1971) and 2: 859. 1971.

Macbride (1960) notes "Corollas lacking in type which resembles C. caudatum L. but leaves not revolute, rachis exceptionally thick and calyx 2-lobed.....; it may be conspecific with C. reticulatum HBK.....to which in manuscript I had referred it; it

may, however, as so often with northern species, be a southern development. Type [is] a shrub about 1 m. tall, the flowers greenish." He cites only Weberbauer 873 from Puno, Peru.

CITHAREXYLUM LEMSII Moldenke, Phytologia 18: 209—210. 1969.

Bibliography: Moldenke, Biol. Abstr. 50: 7999. 1969; Moldenke, Phytologia 18: 209—210. 1969; Hocking, Excerpt. Bot. A.18: 444. 1971; Moldenke, Fifth Summ. 1: 87 (1971) and 2: 859. 1971; Heslop-Harrison, Ind. Kew. Suppl. 15: 33. 1974.

Citations: COSTA RICA: Guanacaste: Lems 64090302a (N—type).

xCITHAREXYLUM LEONIS Moldenke, Phytologia 31: 25—26. 1975.

Synonymy: Citharexylum caudatum L. x C. tristachyum Turcz. ex Moldenke, Phytologia 31: 394, in syn. 1975. Citharexylum tristachyum Turcz. x C. caudatum L. ex Moldenke, Phytologia 31: 394-395, in syn. 1975.

Bibliography: Moldenke, Phytologia 31: 25--26, 346, 380, & 394. 1975.

The specimen cited below was originally distributed by the collector as C. caudatum L., later re-identified and cited by me as C. tristachyum Turcz. It seems to me now most probable that it represents a natural hybrid between the two species.

Citations: CUBA: Las Villas: León & Clément 6683 (Ha--isotype, N—type).

CITHAREXYLUM LIGUSTRINUM Van Houtte

Additional synonymy: Baillonia spicata Bn. ex G. Klein, Handb. Pflanzenanal. 3 (2): 1224. 1932. Lippia lingustrinifolia El-Gazzar & Wats., New Phytol. 69: 483. 1970. Lippia ligustrinifolia Thuret ex El-Gazzar & Wats., New Phytol. 69: 485. 1970. Citharexylum pringlei Van Houtte, in herb.

Additional & emended bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 80, 81, & 95. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 50. 1901; Hérissey, Compt. Rend. Acad. Sci. Paris 179: 1419—1420. 1924; Hérissey, Bull. Soc. Chim. Biol. 7: 195--201. 1925; Hérissey, Chem. Abstr. 19: 843. 1925; Hérissey, Journ. Pharm. & Chim., ser. 8, 1: 208—215. 1925; Wangerin in Just, Bot. Jahresber. 53 (2): 645. 1925; Fedde & Schust. in Just, Bot. Jahresber. 53 (1): 1071 [1053]. 1932; G. Klein, Handb. Pflanzenanal. 3 (2): 1224. 1932; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 50. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 80, 81, & 95. 1946; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14354 & 14355. 1958; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 50. 1959; Bullock, Taxon 9: 99. 1960; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 80, 81, & 95. 1960; Moldenke, Phytologia 13: 295--296. 1966; Farnsworth, Blomster, Quimby, & Schermerh., Lynn Index 6: 263. 1969; El-Gazzar & Wats., New Phytol. 69: 483 & 485. 1970; Moldenke, Fifth Summ. 1: 68, 357, 395, 429—431, & 434—436 (1971) and 2: 548, 557, 558, 859, & 971. 1971; Fletcher in Hillier, Man. Trees & Shrubs, ed. 2, 76 (1972) and imp. ed.,

76. 1972; Rouleau, Taxon Index Vol. 1—20, part 1: 88. 1972; Hegnauer, Chemotax. Pfl. [Chem. Reihe 21]: 661. 1973; Moldenke, Phytologia 27: 363 & 364 (1973) and 30: 181. 1975.

Fletcher (1972) describes a Citharexylum "spicatum Rusby (bessonianum)" as "Evergreen shrub with leathery, lanceolate leaves. The fragrant, white, Verbena-like flowers are produced in drooping spikes. Only suitable for the mildest gardens. Bolivia." His description applies to C. ligustrinum, of which C. bessonianum Tod. is a synonym, of Mexico, but C. spicatum Rusby, of Bolivia, is a synonym of Aegiphila spicata (Rusby) Moldenke, not known from cultivation, not agreeing with his description, and with nothing at all to do with Citharexylum ligustrinum.

Recent collectors describe C. ligustrinum as a shrub or tree, 0.5—5 m. tall, mostly small, upright-branching, and evergreen, the leaves lustrous, the flowers with an agreeable odor, and the fruit abundant, orange-green to red, dark-red, or finally blackish. They have found it growing in mesophytic pine and oak woods, in low evergreen forests of primary vegetation, in moist woods, on slopes, in ravines, on obsidian in Pinus patula woods, and along roadsides and trailsides, at altitudes of 1120—2140 meters, flowering in March, July, and August, and fruiting in August, September, and November. Ventura A. refers to it as scarce or even rare in Veracruz, Mexico. Rzedowski says "flores de color rijizo oscuro", but the specimens comprising this collection seen by me are only in fruit, so it seems obvious that he intended to say "frutos" instead of "flores".

The corollas are said to have been "white" on Ventura A. 1181, "moradas" on Ventura A. 2035, and "lavender" on F. G. Meyer 4976 & H. E. Moore Jr. 3251, while Peele refers to them as having the "corolla-lobes white suffused and fringed with violet". Meyers claims that the species is a "Native of Brazil", but this is entirely incorrect: it is endemic to Mexico.

Hérissey (1924, 1925) reports finding baillonioside and baillonigenol in the vegetative parts of this plant.

Material has been misidentified and distributed in some herbaria as C. poeppigii Walp.

Additional citations: MEXICO: Hidalgo: H. E. Moore Jr. 3251 (Ba); Pringle 15608 (Bl—149606, Tu—98519, Tu—134871); J. Rzedowski 23442 (Z), 28651 (Mi); Vela G. 907 (Ip, Up). Puebla: V. E. Rudd 2018 (Mi, W—2574716A); Vela G. 1086 (Ip). Veracruz: Beaman & Alvarez del Castillo 5683 (Ld); Ventura A. 1181 (Mi, Tu—178837), 2033 (Au—294786, Mi, N). CULTIVATED: France: F. G. Meyer 4976 [U. S. Dept. Agr. Pl. Introd. 241352] (Ba). Pennsylvania: Peele 621 [Longwood Gard. acc. 58421] (Ba).

CITHAREXYLUM LUCIDUM Schlecht. & Cham.

Additional & emended bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 549 & 550. 1893; A. R. Northrop in J. I. Northrop, Naturalist in Bahamas 180 & 204. 1910; Jacks. in Hook.

f. & Jacks., Ind. Kew., imp. 2, 1: 549 & 550 (1946) and imp. 3, 1: 549 & 550. 1960; Moldenke, Phytologia 14: 507. 1967; Moldenke, Résumé Suppl. 16: 2. 1968; Moldenke, Fifth Summ. 1: 68, 427, 429, 432, 434, 435, & 474 (1971) and 2: 859. 1971; Moldenke, Phytologia 31: 359. 1975.

The C. lucidum described by Northrop (1910) is certainly not the present species going under that name. Most probably it is the C. lucidum of Grisebach to which she is here referring, in part, at least, and this is now regarded as a synonym of C. spinosum L. The geographic distribution which she cites, however, is probably a combination of the ranges of the true C. lucidum Schlecht. & Cham. and of C. caudatum L., C. fruticosum L., and C. spinosum L.

Recent collectors describe the true C. lucidum as a shrub or "shrubby plant", 5 m. tall, or a tree, 6 m. tall, with orange fruit and white flowers, and have encountered it on the sides of arroyos in mixed forests and in primary vegetation in low evergreen forests, at 800 m. altitude, flowering in December and January and fruiting in January and February. Ventura A. refers to it as "scarce".

Material has been misidentified and distributed in some herbaria as C. fruticosum L.

Additional citations: MEXICO: Chiapas: F. Miranda 6318 (W—2508472). Veracruz: Beaman 5409 (Ld); Beaman & Alvarez del Castillo 5799 (Z); Ventura A. 2987 (Au—303953, Mi).

CITHAREXYLUM LYCIOIDES D. Don

Additional & emended bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 550. 1893; Prain, Ind. Kew. Suppl. 4, imp. 1, 49. 1913; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 550. 1946; Prain, Ind. Kew. Suppl. 4, imp. 2, 49. 1958; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 550. 1960; Moldenke, Phytologia 14: 507. 1967; Moldenke, Fifth Summ. 1: 68, 429, & 435 (1971) and 2: 859. 1971.

Recent collectors describe this as a shrub, 1—2.5 m. tall, and have encountered it on hillslopes, on igneous slopes with Yucca and Myrtillocactus geometrizans, in spiny matorral, and, according to González Quintero, in "matorral crassicaule alterado" and on "ladera caliza con vegetación de Flourensia resinosa", at altitudes of 1900—2900 meters, flowering in April, and fruiting in June, July, and September.

Additional citations: MEXICO: Hidalgo: Díaz M. 137 (Mi, N); Gómez Pompa 961 (Mi); González Quintero 1099 (Ip), 2338 (Ip), 2600 (Ip, Mi), 2725 (Mi), 3525 (Au—256456, Ip, Mi, Ws), s.n. [29.IV.1965] (Ws).

CITHAREXYLUM MACRADENIUM Greenm.

Additional & emended bibliography: Prain, Ind. Kew. Suppl. 4, imp. 1, 49 (1913) and 4, imp. 2, 49. 1958; Moldenke, Phytologia

13: 296. 1966; Moldenke, Résumé Suppl. 16: 4. 1968; Gibson, Fieldiana Bot. 24 (9): 185. 1970; Moldenke, Fifth Summ. 1: 87, 90, 432, 434, & 474 (1971) and 2: 859. 1971; Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 93, 98, & 145. 1973; Moldenke, Phytologia 31: 345, 346, 352, & 379. 1975.

Recent collectors describe this species as a large tree, 6—20 m. tall, the trunk 20 cm. in diameter at breast height, the stems square, and the fruit pendulous, orange or bright-orange, "china-white when mature" (according to Dwyer and his associates), at altitudes of 1000—2000 meters, flowering from July to September, and fruiting in March, August, and November. Wilbur & Stone refer to it as "occasional".

The corollas are said to have been "white" on Dwyer & Hayden 7077 and A. Jiménez 933, but on Croat & Porter 15630 it is merely stated that the "petals [are] white". The fruits are sometimes erroneously referred to as "berries" instead of drupes.

The Burger 3842 and Lent 2236, distributed as C. macradenium, are actually C. donnell-smithii Greenm.

Additional citations: COSTA RICA: Alajuela: A. Jiménez 933 (N). Cartago: Lems 6409110303 [5158] (N); Wilbur & Stone 10181 (Mi, N). Puntarenas: Burger & Gentry 8800 (N). PANAMA: Chiriquí: Croat & Porter 15630 (N); Dwyer & Hayden 7077 (Z), 7709 (Ld). Coclé: P. H. Allen 2784 (E—1213499). LOCALITY OF COLLECTION UNDETERMINED: Collector undetermined 9868 (N).

CITHAREXYLUM MACROCHLAMYS Pittier

Additional bibliography: Moldenke, Phytologia 6: 460—461. 1959; Moldenke, Résumé Suppl. 16: 4. 1968; Moldenke, Fifth Summ. 1: 90, 115, & 434 (1971) and 2: 860. 1971; Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 93—94 & 145. 1973.

Duke refers to this plant as a tree, leaning "over a river", the trunk 10 cm. in diameter at breast height, and the branches arching. The corollas are said to have been "white" on Duke 13550.

The Romero Castañeda 1141, distributed as C. macrochlamys, is actually C. mirifolium Moldenke.

Additional citations: PANAMA: Darién: J. A. Duke 13550 (Oh, W—2629869, Z).

CITHAREXYLUM MACROPHYLLUM Poir.

Additional & emended bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 550 (1893), imp. 2, 1: 550 (1946), and imp. 3, 1: 550. 1960; Veillon, Revist. Forest. Venez. 5: 67. 1962; Moldenke, Phytologia 14: 507. 1967; Moldenke, Résumé Suppl. 16: 5. 1968; Rollet, Adansonia, ser. 2, 8: 542 & 549. 1968; J. A. Steyerm., Act. Bot. Venez. 3: 72, 76, & 156. 1968; Moldenke, Fifth Summ. 1: 115, 122, 129, 131, 133, & 148 (1971) and 2: 860. 1971; Roth & Mérida de Bifano, Act. Biol. Venez. 7: 131. 1971; Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 94 & 145. 1973; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 15: 17—

19. 1975.

Recent collectors describe this plant as a tree, to 22 m. tall, with curved bole, slightly fluted at the base, the trunk diameter 10--15 cm. [determined by measurement of 115 trees], the bark rather smooth, grayish-brown, very slightly fissured, the leaves thinly chartaceous, very slightly scabrid, shining and medium-green above, pale-green and dull beneath, the calyx pale-green, and the corollas [on Breteler 5039] pale-yellow. They have found it growing in primary forests, at 320—1200 meters altitude, flowering in March. The name, "totumillo", is recorded for it. Wood vouchers have been taken from Breteler 5039 [from a height of 0.3—1.1 m. from the base of the trunk] and from Murça Pires 51847.

López-Palacios (1975) comments that "Según registros, parece ser que el C. macrophyllum es uno de los C. que alcanza mayor parte, si no el mayor, en Venezuela: hasta 30 m. El material de herbario en flor es fácilmente confundible con el C. poeppigii, y aun los mismos especialistas y botánicos de nota han caído en esta confusión.....Sin embargo, cuando están en fruto los dos taxa son inconfundibles: los frutos maduros del C. poepigii [sic] son rojos, muy llamativos, vistosos y ornamentales, no llegan a 1 cm. de diámetro, son de ápice redondeado y secan en color café o marrón; los del C. macrophyllum son amarillo verdosos, hasta 2 cm. de diámetro, apiculados en el ápice, y secan en negro o en castaño claro. Tales frutos son más fáciles de confundir con los del C. venezuelense. Sin embargo, estos dos últimos taxa se diferencian claramente por el indumento del envés de sus hojas: pubescent en el venezuelense, glabro o glabrescente en el macrophyllum.....El Dr. Moldenke anota 'que las glándulas basales craterimorfas son muy diferentes de las discoides aplanadas de otras especies del género', pero esta característica no debe ser tan firme, pues, como hemos visto, las confusiones son frecuentes. He dejado sin considerar a Rodríguez & Pérez 2644 (MER), Río San Pedro, 200 Km. al S. de Caicara. Edo. Bolívar, como specimen denuo recognoscendum, por tratarse de material estéril y muy incierto."

Additional citations: VENEZUELA: Bolívar: Breteler 5039 (W—2583466A, W—2583467A). BRAZIL: Pará: Murça Pires 51847 (W—2548597). Roraima: Prance, Forero, Pena, & Ramos 4370 (Ld, N, S).

CITHAREXYLUM MATUDAE Moldenke

Additional bibliography: Hocking, Excerpt. Bot. A.7: 454. 1964; Moldenke, Phytologia 13: 297. 1966; G. Taylor, Ind. Kew. Suppl. 14: 34. 1970; Moldenke, Fifth Summ. 1: 68 (1971) and 2: 860. 1971.

CITHAREXYLUM MEXICANUM Moldenke

Additional bibliography: Moldenke, Phytologia 6: 464—465. 1959; Moldenke, Fifth Summ. 1: 68 (1971) and 2: 860. 1971.

CITHAREXYLUM MICROPHYLLUM (P. DC.) O. E. Schulz

Additional bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 1206 (1893) and imp. 1, 2: 275. 1894; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 116 (1901) and 1, imp. 2, 116. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 1206 (1946) and imp. 2, 2: 275. 1946; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 116. 1959; Moldenke, Phytologia 6: 465—467. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 1206 (1960) and imp. 3, 2: 275. 1960; Moldenke, Fifth Summ. 1: 102 & 471 (1971) and 2: 531 & 860. 1971.

CITHAREXYLUM MIRIFOLIUM Moldenke

Additional bibliography: Moldenke, Phytologia 13: 297—298. 1966; Moldenke, Résumé Suppl. 16: 5. 1968; Moldenke, Fifth Summ. 1: 115 & 122 (1971) and 2: 860. 1971; Moldenke, Phytologia 28: 436 (1974) and 31: 382 & 457. 1975; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 15: 14 & 18—19. 1975.

Recent collectors describe this plant as a shrub, 3—4 m. tall, or a tree, 12 m. tall, the bark pale-chocolate, the petioles salmon-color, the flowers fragrant, and the calyx green. The corollas on Romero-Castañeda 1141 are said to have been white when fresh. The species has been found growing in quebradas, at altitudes of 600—2600 meters, flowering in July, August, and December, and fruiting in December.

Ruiz-Terán and his associates describe the species as an "Árbol [or] arbolito inerme, perennifolio, 4—8 m. Tronco irregularmente cilíndrico, 20—25 cm de diámetro. Corteza pardo negruzca, fisurada. Madera fresca de color amarillo pálido luego de exposición al aire. Hojas verde obscuras, lucientes por la haz, más claras por el envés. Corola blanco verdusula por fuera, blanca por dentro, con tomento crespo, blanco, en la garganta y 1/2 a 2/3 inferiores de los lobulos, estos con apice rojo vinoso en algunas flores." Of their no. 6740 they note "muestra de control, topotipo". The vernacular name, "palomero", is recorded.

Material has been misidentified and distributed in some herbaria as C. macrochlamys Pittier. On the other hand, the Breteler 4314, cited below, is regarded by López-Palacios as xC. hybridum Moldenke. This very careful contemporary worker asserts that in C. mirifolium the leaves are completely glabrous beneath, while in xC. hybridum they have pubescence in the axils of the larger veins. He also asserts that C. mirifolium is an upland species, while xC. hybridum (like its supposed parents) is only found in the lowlands. Breteler describes his plant as a tree, 12 m. tall, the trunk 25—30 cm. in diameter at breast height, the bark fissured, the leaves papery or thin-coriaceous, smooth, glossy and medium-green above, paler and dull beneath, the fruit subglobose-ellipsoid, laterally compressed, smooth, glossy, pale-green, brownish-tinged [probably immature]. He encountered it at an altitude of 600 meters, fruiting in December.

López-Palacios annotated the United States National Herbarium specimen in 1972 as "Cith. aff. fruticosum L. - probabiliter sp. nov."

In his 1975 work, under C. mirifolium, he comments that "En la descripción que hago para la Flora, complemento la del Dr. Moldenke......con datos nuevos, como los de dimensions y características florales, basados en observaciones personales y en colecciones hechas conjuntamente con el Prof. Ruiz-Terán. El Dr. Moldenke consideraba la especie sin glándulas, cuya presencia fue observada por nostros (Ruiz-Teráb y yo), al tiempo que observamos también la denticulación de las hojas jóvenes,"

Commenting on my statement that C. mirifolium is obviously closely related to C. fruticosum L., he says: "Yo la considero mucho más afín a C. reticulatum HBK al que se asemeja muchísmo en los ejemplares de herbario y del que apenas parece diferir en pequeñismos detalles. En el Vth Sumary [sic]....se citan como localidades para este taxon los Edos. Falcón, Mérida y Trujillo. La cita de Falcón estaba basada en Breteler 4313, excluido de aquí por las razones que ya expusieron en su debido lugar; también mis primeras dudas a este respecto se baseron en razones ecológicas: si el C. mirifolium, especie paramuna, pudiera prosperar en las zonas bajas de Falcón."

The "Falcón", Venezuela, listed by me in my Fifth Summary (1971) for C. mirifolium was indeed based on the above-mentioned Breteler collection and is therefore erroneous. Citharexylum mirifolium is not known from that state of Venezuela as of now.

Additional citations: COLOMBIA: Bolívar: Romero Castañeda 1141 (W—2104708). VENEZUELA: Mérida: Ruiz-Terán & López-Palacios 661 (N); Ruiz-Terán, López-Palacios, & Rodriguez 6740 (N). Trujillo: Aristeguieta 3690 (N); Ruiz-Terán & López-Palacios 7452 (Ld).

CITHAREXYLUM MOCINNI D. Don

Additional & emended synonymy: Citharexylum tomentosum Sessé & Moc. ex D. Don, Edinb. New Philos. Journ. 11 (Jan.—Mar.): 238, in syn. 1831 [not C. tomentosum Humb. & Bonpl., 1821, nor H.B.K., 1817, nor Klotzsch & Karst., 1940, nor Kunth, 1847, nor Poir., 1811]. Citharexylum mocinnii D. Don ex Moldenke, Alph. List Invalid Names 58, in syn. 1942; Gibson, Fieldiana Bot. 24 (9): 184 & 190. 1970.

Additional & emended bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 550 (1893), imp. 2, 1: 550 (1946), and imp. 3, 1: 550. 1960; Moldenke, Phytologia 14: 507—508. 1967; Moldenke, Résumé Suppl. 15: 3 (1968) and 16: 3. 1968; Gibson, Fieldiana Bot. 24 (9): 184 & 190. 1970; Moldenke, Fifth Summ. 1: 68, 83, 85, 87, 430, 434, 436, & 437 (1971) and 2: 860. 1971; Farnsworth, Pharmacog. Titles 7 (10): v. 1972; Fong, Trojánkova, Troják, & Farnsworth, Lloydia 39: 147. 1972; Moldenke, Phytologia 23: 415 & 428 (1972) and 31: 462. 1975; Farnsworth, Pharmacog. Titles 7, Cum. Gen. Ind. [29]. 1975; Molina R., Ceiba 19: 95. 1975.

It should be noted here that Gibson (1970) feels that C. lan-

kesteri Moldenke should be added to the synonymy of C. mocinni.

Recent collectors describe C. mocinni as a slender tree, 4—30 m. tall, or an evergreen erect shrub, 2—6 m. tall, the trunk 15—25 cm. in diameter at breast height, the flowers "verbenaceous", and the fruit "on long dangling spikes", orange or yellow-orange, black in drying. They have found it growing in pinewoods, oak woods, cloud-forests, and primary vegetation of deciduous woods, in forests and cutover cloud-forests, in hillside matorral, on flat ground with pinewoods vegetation, along trails, at the foot of cascades, on hillsides with oak or with Liquidambar woods, on steep slopes with Quercus, Pinus, Liquidambar, Podocarpus, and Magnolia, or on steep heavily wooded slopes with Taxodium, Erythrina, Piper, and Liquidambar, at altitudes of 800—2350 meters, flowering from January to April and August to October, and fruiting from January to April as well as in June and August.

Hatheway & Schnell describe it as "common in open oak forests of the Lower Montane Moist Forest type". Ventura A. refers to it as "scarce", "very scarce", or "rare" in Veracruz, while Hinton refers to it as "rare" in México state. The corollas are said to have been "white" on J. Rzedowski 22113 and Ton 3555, "whitish" on Ventura A. 2729, "cream-color" on Weaver, Foster, & Kennedy 1717, and "verduzca" on Ventura A. 4820.

Material has been misidentified and distributed in some herbaria as C. lankesteri Moldenke, but, on the other hand, the Williams & Molina R. 13703, distributed as C. mocinni, is actually C. lankesteri.

Additional citations: MEXICO: Chiapas: E. W. Lathrop 6783 (Du—586091); Stone & Broome 2821 (Mi, N); Ton 2576 (Mi), 2826 (Mi), 3555 (Mi, Mu), 3598 (Z), 3913 (Mi). Jalisco: R. McVaugh 23221 (Ip). México: Hinton 5393 (Se—120068, Tu—112041), 8744 (Se—120067, Tu—84914, Tu—98518, Tu—112040); J. Rzedowski 22113 (Ip, Mi, Mi). Nayarit: R. McVaugh 12092 (N). Veracruz: Dorantes Lopez 550 (Ld); Ventura A. 619 (Mi, Tu—178148, Tu—180487, Ws), 2443 (N), 2729 (Au—303174, Mi, N), 3443 (Mi), 4820 (Mi); Weaver, Foster, & Kennedy 1717 (Mi). NICARAGUA: Jinotega: Molina R. 22923 (N, Ws). Matagalpa: Williams, Molina R., & Williams 23630 (N); Williams, Molina R., Williams, Gibson, & Laskowski 27756 (N). COSTA RICA: Cartago: Hatheway & Schnell 1480 (W—2512767).

CITHAREXYLUM MOCINNI var. LONGIBRACTEOLATUM Moldenke

Additional & emended synonymy: Citharexylum mocinnii var. longibracteatum Moldenke, Phytologia 6: 471, in syn. 1959; Gibson, Fieldiana Bot. 24 (9): 184 & 190. 1970.

Additional bibliography: Moldenke, Phytologia 13: 298. 1966; Gibson, Fieldiana Bot. 25 (9): 184 & 190. 1970; Moldenke, Fifth Summ. 1: 68, 78, 83, & 434 (1971) and 2: 860. 1971; Moldenke, Phytologia 23: 428. 1972; Molina R., Ceiba 19: 95. 1975.

CITHAREXYLUM MONTANUM Moldenke

Additional bibliography: Moldenke, Phytologia 14: 508. 1967; Moldenke, Fifth Summ. 1: 115, 135, & 357 (1971) and 2: 860. 1971.

The Barclay, Juajibioy, & Gama 3580, distributed as C. montanum, actually is the closely related C. subflavescens Blake.

CITHAREXYLUM MONTANUM var. CHIMBORAZENSE Moldenke

Additional bibliography: Moldenke, Phytologia 13: 298. 1966; Moldenke, Fifth Summ. 1: 135 (1971) and 2: 860. 1971.

CITHAREXYLUM MONTEVIDENSE (Spreng.) Moldenke

Additional & emended synonymy: Citharexylum montevidense Spreng. ex Tomlinson, Journ. Arnold Arb. 54: 120. 1973. Cytharexylon barbinerve Cham. ex Gilbert, Enum. Pl. Montev. 45. 1873. Cytharexylon montevidense Martínez-Crovetto, Bonplandia 1: 196. 1963. Cytarexylun montevidense (Spr.) Moldenke, Phytologia 26: 372, in syn. 1973.

Additional & emended bibliography: D. Dietr., Syn. Pl. 1: 630. 1839; Vesque, Ann. Sci. Nat. Paris, ser. 7, 1: 336 & 341—343. 1885; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 549 & 823. 1893; Venturi & Lillo, Contrib. Conoc. Arb. Argent. 104. 1910; Anon., Ind. Sem. Ofr. Canje Jard. Bot. Montev. 3. 1935; Fedde & Schust. in Just, Bot. Jahresber. 60 (2): 571. 1941; Santos Biloni, Suelo Argent. 3: 663 & 679. 1944; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 549 & 823. 1946; Cabrera, Man. Fl. Alred. Buenos Aires 390 & 391, fig. 145. 1953; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14355. 1958; Cain, Man. Veg. Anal., imp. 1, 226. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 549 & 823. 1960; Martínez-Crovetto, Bonplandia 1: 196. 1963; Angely, Fl. Anal. Paran., ed. 1, 578. 1965; Troncoso in Cabrera, Fl. Prov. Buenos Aires 5: 148 & 149, fig. 50. 1965; Moldenke, Phytologia 14: 508. 1967; Moldenke, Résumé Suppl. 17: 9. 1968; Reitz, Sellowia 22: 34. 1970; Angely, Fl. Anal. & Fitogeogr. S. Paulo, ed. 1, 4: 830 & iv. 1971; Cain, Man. Veg. Anal., imp. 2, 226. 1971; Moldenke, Fifth Summ. 1: 148, 185, 188, 195, 357, 426, 428, 430, 431, 434, 473, & 474 (1971) and 2: 491, 617, & 860. 1971; Anon., Biol. Abstr. 56 (8): B.A.S.I.C. S.53. 1973; K. E. Clausen, Biol. Abstr. 56: 4183. 1973; Tomlinson, Journ. Arnold Arb. 54: 120. 1973; Farnsworth, Pharmacog. Titles 9 (3): vi. 1974; R. D. Gibbs, Chemotax. Flow. Pl. 4: 1753—1755 & 2079. 1974; Moldenke, Phytologia 28: 448. 1974; Troncoso, Darwiniana 18: 373—375, 377, 378, & 408, fig. 26. 1974; Moldenke, Phytologia 31: 458. 1975.

Additional illustrations: Santos Biloni, Suelo Argent. 3: 663 & 679. 1944; Cabrera, Man. Fl. Alred. Buenos Aires 390, fig. 145. 1953; Troncoso in Cabrera, Fl. Prov. Buenos Aires 5: 149, fig. 50. 1965; Troncoso, Darwiniana 18: [364], fig. 26. 1974.

Tomlinson (1973) points out that dioecism was reported for this species by Arechavaleta in 1902. It has since also been described for C. fruticosum L. Venturi & Lillo (1910) report the vernacular names, "aguaý-guazú", "tarumá con espinas", and "taruman espinudo",

for this species in Argentina and describe it as an "Arbol abundante no muy alto pero á veces grueso que vive en las isletas de bosques en el interior de Corrientes. La madera es blanca no muy blanda. Es poco utilizado."

The Angely (1971) reference in the bibliography of this species is sometimes cited as "1970", which is the title-page date, but the work was not actually issued until 1971.

Troncoso (1965) gives the distribution of this species as "Sur del Brasil, Paraguay, Uruguay y NE. argentino hasta las selvas en galería del Delta y ribera platense; isla de Martín García. Cultivado en calles, parques y plaxas como ornamental." She reports additional vernacular names for it in Argentina: "blanco grande" and "coronillo colorado" and cites Cabrera 1988 & 6359 in the San Isidro herbarium. Cain (1959) describes the species as a mesophanerophyte microphyll.

Recent collectors describe the plant as a tree, 3—4 m. tall, with few spines and fragrant flowers, and have encountered it at the edges of woods, flowering in May and June, and fruiting in December. The corollas are described as having been "cream" colored on Chisholm s.n. and "yellow" on Clos 7357, while on Bracelin 1327 they are said to have been "in bud 612 Carrot Red, open to flower 606/2 Chinese Yellow, RHS [Royal Horticultural Society] Colour Chart 1938—42".

Gibbs (1974) has found cyanogenesis, leucoanthocyanin, and syringin absent from the leaves and stems of this species and reports the Ehrlich test, as well as the HCl/methanol test, gave negative results in the leaves.

Material of C. montevidense has been misidentified and distributed in some herbaria as C. spinosum L. On the other hand, the R. Moran 2775, distributed as C. montevidense, is actually C. ilicifolium H.B.K.

Additional citations: BRAZIL: Rio Grande do Sul: Machado s.n. [Herb. Anchieta 20702] (B); Rambo 8313 (B), 44323 (B); Sehnem 6206 (B). URUGUAY: H. H. Bartlett 21264 (N), 21330 (N). ARGENTINA: Corrientes: Krapovickas, Cristóbal, Arbo, Maruñak, Maruñak, & Irigoyen 16851 (Ld, Ws). CULTIVATED: Argentina: Clos 7357 [Herb. Lab. Bot. Spegazz. 71483] (Ba). California: Bracelin 1327 (Ba); Chisholm s.n. [3 June 1952] (Ba); Jerabek s.n. [Huntington Gardens, June 1945] (Sd—36517). Egypt: Din s.n. [Spring 1868] (Gz); Mahdi s.n. [11.5.1968] (Gz, Gz, Gz).

CITHAREXYLUM MUCRONATUM Fourn. & Moldenke

Additional bibliography: Moldenke, Phytologia 6: 480—481. 1959; Moldenke, Fifth Summ. 1: 85 & 430 (1971) and 2: 792 & 860. 1971; Moldenke, Phytologia 31: 346. 1975.

Bunting & Licht describe this plant as a several-trunked tree, to 4 m. tall, the bark light-gray, the leaves light-green, and the corollas whitish. They found it in flower in April and report the local vernacular name, "panchil". They regard it as C.

caudatum L., a species to which it is certainly closely related and the Central American representatives of which need more careful re-examination and comparison with typical West Indian material. It is very possible that C. mucronatum should be reduced to varietal or form rank under C. caudatum.

Additional citations: NICARAGUA: Chontales: Bunting & Licht 1120 (N, W—2542904).

CITHAREXYLUM MYRIANTHUM Cham.

Additional synonymy: Cytarexylum myrianthis Cham. ex Reitz, Rodriguesia 13: 271, sphalm. 1950. Cytharexylum myrianthum Cham. ex Reitz, Rodriguesia 13: 273 & 285, sphalm. 1950. Cytarexilum mirianthum Cham. ex Souza Sobrinho, Insula 6: 7, sphalm. 1972. Cytharexilum myrianthum Cham. ex Souza Sobrinho, Insula 6: 7, sphalm. 1972.

Additional & emended bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 549. 1893; Briq. in Chod. & Hassl., Bull. Herb. Boiss., ser. 2, 4: 1166. 1904; Briq. in Chod. & Hassl., Pl. Hassler. 2: 502. 1904; T. Peckolt, Bericht. Deutsch. Pharm. Gesel. 14: 475. 1904; Fedde & Schust. in Just, Bot. Jahresber. 60 (2): 571. 1941; Augusto, Fl. Rio Grande do Sul 229 & 236. 1946; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 549. 1946; Reitz, Anais Bot. Herb. Barb. Rodr. 2: 28, 37, & 60. 1950; Reitz, Rodriguesia 13: 271, 273, & 285. 1950; Veloso & Klein, Sellowia 8: betw. 150 & 151, betw. 156 & 157, 182, & 220 (1957) and 10: betw. 76 & 77, 99, & 105. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 549. 1960; Veloso & Klein, Sellowia 15: 102 & 107. 1963; Reitz & Klein, Sellowia 16: 44. 1964; Angely, Fl. Anal. Paran., ed. 1, 578. 1965; Moldenke, Phytologia 14: 508. 1967; Hyland, Pl. Invent. U. S. Dept. Agr. 172: 234. 1968; Veloso & Klein, Sellowia 20: 83 & 122. 1968; Moldenke, Résumé Suppl. 16: 20. 1968; Reitz, Sellowia 22: 34. 1970; Angely, Fl. Anal. & Fitogeogr. Est. S. Paulo, ed. 1, 4: 830 & iv. 1971; Moldenke, Fifth Summ. 1: 148, 185, 195, 357, 428—430, 432, 434—436, & 474 (1971) and 2: 860. 1971; Souza Sobrinho, Insula 6: 7 & 17. 1972; Moldenke, Phytologia 25: 230 & 238. 1973; Troncoso, Darwiniana 18: 373, 375, & 408. 1974; Moldenke, Phytologia 31: 338. 1975.

Recent collectors describe this species as a tree or treelet, 6—12 m. tall, the trunk 12—25 cm. in diameter, the bark smoothish, gray-brown, and the flowers fragrant. They have found it growing in arroyos, in secondary woods, at the edges of woods, in virgin rainforests, and in "mata planicie litoranea", as well as at the edges of rivers, at altitudes of about 20 meters, flowering in December and fruiting in January. Souza Sobrinho (1972) reports it from Santa Catarina Island, Brazil. The corollas are said to have been "white" on Hatschbach 18121 & 35582, Reitz 1768, and Woolston 610, "whitish" on Hatschbach 25760, and "clear-yellow" on Krapovickas & al. 16894. The vernacular name, "sàrà-moroti" is reported for it.

Hyland (1968) records the species as cultivated in Maryland from seed collected by Edgar Ribas in Brazil and introduced as

no. 300615 in the United States Plant Introduction series.

Peckolt (1904) records the vernacular name, "ratimbó", and , notes the local medicinal use of the "bitter schmeckende Wurzelrinde des Baumes in Pulver oder in Tinktur als Tonikum".

The Angely (1971) reference cited in the bibliography above is sometimes listed as "1970", the title-page date, but the work actually was not issued until 1971. It should also be noted here that the cumulative index to Sellowia volumes published to date refers to a mention of this species on page 84 of volume 2, but it is not mentioned on that page as far as I am able to see.

Material of C. myrianthum has been misidentified and distributed in some herbaria as C. cinereum L. or C. solanaceum Cham. On the other hand, the Sehnem 2206, distributed as C. myrianthum, is actually C. montevidense (Spreng.) Moldenke.

Additional citations: BRAZIL: Guanabara: Duarte 1005 [Herb. Jard. Bot. Rio Jan. 61692] (Oa). Paraná: Hatschbach 13623 (Ld, W—2564854), 18121 (Ft, W—2536537), 25760 (N), 35582 (Ld). Rio Grande do Sul: O. Camargo 1138 [Herb. Anchieta 59803] (B), 2541 [Herb. Anchieta 61717] (B), 2603 [Herb. Anchieta 61792] (B); Rambo 1079 (B). Santa Catarina: Reitz 1768 (N). São Paulo: Hunger Filho s.n. [Aout-Sept.-Oct. 1928] (P); Löfgren s.n. [Herb. Com. Geogr. & Geol. S. Paulo 4219; Herb. Inst. Biol. S. Paulo 15628] (P). PARAGUAY: Woolston 610 (N). ARGENTINA: Corrientes: Krapovickas, Cristóbal, Arbo, Maruñak, Maruñak, & Irigoyen 16894 (Ld). Formosa: I. Morel 4397 (N).

CITHAREXYLUM OBTUSIFOLIUM Kuhlmann

Additional bibliography: Moldenke, Phytologia 6: 487. 1959; Moldenke, Fifth Summ. 1: 148 & 474 (1971) and 2: 860. 1971.

CITHAREXYLUM OLEINUM (Benth.) Moldenke

Additional & emended bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 477 (1894) and imp. 1, 2: 848 (1895), imp. 2, 2: 477 & 848 (1946), and imp. 3, 2: 477 & 848. 1960; Moldenke, Phytologia 14: 508. 1967; Moldenke, Fifth Summ. 1: 68, 357, 433, & 435 (1971) and 2: 595, 619, & 860. 1971; Moldenke, Phytologia 23: 414 (1972) and 31: 335. 1975.

Recent collectors describe this species as a small shrub, 1—2.5 m. tall, with scentless flowers, and have encountered it in chaparral vegetation, in xerophilous matorral or Flourensia resinosa matorral, on Juniperus flaccida slopes, in crevices of lime rocks, and in pinewoods, pine-oak woods, or pine-juniper woods, at altitudes of 1900—2800 meters, flowering from April to June and in August, and fruiting in February, May, and August. McVaugh reports it as "abundant on north slopes of barrancas in the lower limit of the pinyon-juniper belt"; Cruz Cisneiros found it on "ladera caliza con vegetación de matorral xerófila", while Gonzalez Quintero found it on "ladera caliza con vegetación espaciada" and in "encinar arbustivo" and on "cerro caliza". The corollas are said to have been "white" on McVaugh 10360 and on

Moore & Wood 4365.

Additional citations: MEXICO: Hidalgo: González Quintero 2076 (Au—253679, Ip, Mi), 2389 (Ip, Mi), 2445 (Ip, Mi), 2515 (Ip, Mi, Ws), 2856 (Au—249553, Ip), 3558 (Ip, Mi), 3590 (Ip); Moore & Wood 4365 (Ba, W—2594870). Oaxaca: Cruz Cisneros 2136 (Au—303115, Mi, N), 2644 (Mi). Querétaro: R. McVaugh 10360 (Au--237055, N). San Luis Potosí: J. Rzedowski 6655 (Au—237991). Tamaulipas: González Quintero 3824 (Mi).

CITHAREXYLUM OVATIFOLIUM Greenm.

Additional bibliography: Moldenke, Phytologia 13: 301. 1966; Moldenke, Fifth Summ. 1: 68 (1971) and 2: 860. 1971.

Rzedowski describes this plant as a shrub, 2 m. tall, and found it growing in woods of Quercus, Pinus, Abies, Clethra, and Ternstroemia, at an altitude of 2400 meters, fruiting in April.

The González Quintero 474, distributed as C. ovatifolium, is actually C. hidalgense Moldenke.

Additional citations: MEXICO: Morelos: J. Rzedowski 22165 (Ip); Pringle 6540 (Ms—30923—isotype).

CITHAREXYLUM PACHYPHYLLUM Moldenke

Additional bibliography: J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 669, 671, 672, 674, & 677—678. 1960; Moldenke, Phytologia 14: 508. 1967; Moldenke, Résumé Suppl. 15: 4. 1967; Hocking, Excerpt. Bot. A.12: 424. 1967; Moldenke, Biol. Abstr. 49: 1325. 1968; Moldenke, Fifth Summ. 1: 140 (1971) and 2: 860. 1971; Moldenke, Phytologia 31: 339 & 350. 1975.

Macbride (1960) comments that "Description of flowers apparently taken by Moldenke from the more oblong-leaved Ayacucho specimen. Leaves of Metcalf specimens suborbicular, scarcely 1 cm. long; fruit to 11 mm. long, 13 mm. wide, deep purple, very firm. Related to C. ilicifolium HBK., C. dentatum D. Don, C. punctatum Greenm......the type a shrub to 2 meters tall. I had referred my collection (the type) to the shrub of HBK., that perhaps, at least typically, only in Ecuador; it is the earliest name among these similar shrubs, if they are not specifically distinct; the Metcalf specimen is toward C. punctatum. Both Asplund 11496 and Mathews 1021 were referred here by Moldenke but localities were not given by him." He cites only Macbride 3090 from Junín, Weberbauer 5565 from Ayacucho, and Metcalf 30464 from Puno, Peru.

CITHAREXYLUM PACHYPHYLLUM var. CANESCENS Moldenke

Additional bibliography: Moldenke, Phytologia 14: 508—509. 1967; Moldenke, Résumé Suppl. 15: 4. 1967; Hocking, Excerpt. Bot. A.12: 424. 1967; Moldenke, Biol. Abstr. 49: 1325. 1968; Moldenke, Fifth Summ. 1: 140 (1971) and 2: 860. 1971.

CITHAREXYLUM PENTANDRUM Vent.

Additional & emended bibliography: Desf., Tabl. École Bot., ed. 1, 54. 1804; Willd., Enum. Pl. Hort. Berol. 2: 649—650. 1809; Desf., Tabl. École Bot., ed. 2, 65. 1815; Pers., Sp. Pl. 3: 357. 1819; Bocq., Adansonia, ser. 1, 2: 88, 123, & 130 (1862) and 3: 223. 1863; Kuntze, Rev. Gen. Pl. 2: 504. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 550 (1893), imp. 2, 1: 550 (1946), and imp. 3, 1: 550. 1960; Moldenke, Phytologia 14: 509. 1967; Moldenke, Fifth Summ. 1: 100, 102, 104, 357, 428, 430—437, & 453 (1971) and 2: 860. 1971; A. L. Moldenke, Phytologia 23: 318. 1972; Little, Woodbury, & Wadsworth, Trees P. R. & Virg. Isls. 2 [U. S. Dept. Agr. Agric. Handb. 449]: 990 & 1000. 1974; Moldenke, Phytologia 31: 459. 1975.

Desfontaines (1804, 1815) lists the French vernacular names, "bois-guitare à 5 étamines" and "bois-guittare à 5 étamines", for this species.

Kuntze (1891) was of the opinion that C. pentandrum is identical with what he called C. villosum var. integerrimum [now known as C. integerrimum (Kuntze) Moldenke]. He says: "C. villosum Jacq. var. integerrimum O. Ktze. Costarica. Diese Art, wozu auch C. pentandrum Vent. gehören dürfte, ist durch die kurz behaarte Inflorescenz mit subsessilen Blüthen, trichterigen kurzgezähnten Kelchen, sehr kurz Corollen, deren Röhre den Kelch kaum überragt, schwach behaarte lanzettliche (1: 2 1/2 — 5) nicht lederige Blätter ausgezeichnet; die Blättern ändern etwas gezähnt bis ganzrandig." Little and his associates regard it as a synonym of C. fruticosum (but surely not of the typical glabrous leathery leaves typical form of this species!).

xCITHAREXYLUM PERKINSI Moldenke

Additional bibliography: Moldenke, Phytologia 14: 509. 1967; Moldenke, Fifth Summ. 1: 100, 104, 432, 435, & 436 (1971) and 2: 860. 1971; A. L. Moldenke, Phytologia 23: 318. 1972; Little, Woodbury, & Wadsworth, Trees P. R. & Virg. Isls. 2 [U. S. Dept. Agr. Agric. Handb. 449]: 858 & 1000. 1974; Moldenke, Phytologia 31: 346. 1975.

Wagner describes this plant as a woody shrub, 10 feet tall, the leaves leathery and shiny, and the fruit (in October) green and reddish, shiny, and hard.

Additional citations: PUERTO RICO: R. J. Wagner 1259 (Ws).

CITHAREXYLUM PERNAMBUCENSE Moldenke

Additional bibliography: Moldenke, Phytologia 6: 497--498. 1959; Moldenke, Fifth Summ. 1: 148 (1971) and 2: 860. 1971.

CITHAREXYLUM POEPPIGII Walp.

Additional synonymy: Citharexylon poeppigii Walp., Repert. Bot. Syst. 4: 76. 1845. Cytarexylum poeppigii Cuatrecasas, Revist. Acad. Colomb. Cienc. 10: 235. 1958. Citharexylon poeppigi Walp. ex Cain, Man. Veg. Anal., imp. 1, 242. 1959. Citharexylum

poepiggi Walp. ex Moldenke, Résumé Suppl. 18: 9, in syn. 1969. Citharexylum poeppigii Walp. & Moldenke ex Lasser, Braun, & Steyerm., Act. Bot. Venez. 9: 36, sphalm. 1974. Citharexylum poepigii Walp. ex López-Palacios, Revist. Fac. Farm. Univ. Los Andes 15: 17, sphalm. 1975.

Additional & emended bibliography: Walp., Repert. Bot. Syst. 4: 76. 1856; Bocq., Adansonia, ser. 1, 3: [Rev. Verbénac.] 223. 1863; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 550. 1893; T. Peckolt, Bericht. Deutsch. Pharm. Gesell. 14: 475. 1904; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 550. 1946; Cuatrecasas, Revist. Acad. Colomb. Cienc. 10: 235. 1958; R. C. Foster, Contrib. Gray Herb. 184: 169. 1958; Cain, Man. Veg. Anal., imp. 1, 242. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 550. 1960; J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 668, 670, & 678—679. 1960; Hocking, Excerpt. Bot. A.7: 454. 1964; Moldenke, Phytologia 14: 509. 1967; Moldenke, Résumé Suppl. 15: 4 (1967) and 18: 9. 1969; Cain, Man. Veg. Anal., imp. 2, 242. 1971; Dwyer, Raymondiana 4: 70. 1971; Moldenke, Fifth Summ. 1: 115, 122, 135, 140, 148, 181, 430, 433, 435, 474, & 488 (1971) and 2: 860. 1971; Moldenke, Phytologia 25: 228, 229, & 236 (1973) and 28: 435, 436, 448, & 454. 1974; Lasser, Braun, & Steyerm., Act. Bot. Venez. 9: 36. 1974; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 14: 21 (1974) and 15: 18—20, [23], & 24. 1975; Moldenke, Phytologia 31: 358, 381, & 394. 1975.

Recent collectors describe this plant as a large spreading tree, 5—25 m. tall, the trunk 12—25 cm. in diameter at breast height, the leaves opposite and ternate, bright-green above, lighter beneath, the petioles with prominent glands, the racemes arching, the flowers fragrant or very fragrant, the calyx green, and the fruit orange, turning red or deep bright-red when ripe, bitter, eaten by fruit-bats. The corollas are described as having been "white" on López-Palacios & al. 3180, Soejarto & al. 1225, and Uribe 4049 or as "lemon-yellow" on Barclay, Juajibioy, & Gama 3626, while on Barclay, Juajibioy, & Gama 3637 they are described as "corolla-tube pale-green at base, cream above, filaments and anthers pale".

The species has been found growing in pastures, wet wooded areas, and in wooded areas near low hills, at altitudes of 180—900 meters, flowering in April and June to August, fruiting in July, August, and October. Additional vernacular names reported for it are "comida de pombo", "oreja de burro", "oreja de mula", "totumo", and "yujaco".

Uribe reports the species as "es común y de madera apreciada"; Lasser and his associates (1974) found it in cultivation in Venezuela. Cain (1959) asserts that this tree is not emergent over Ceiba pentandra and Mauritia flexuosa where they grow together on Araparí Island. He refers to it as a phanerophyte on varzea land.

Peckolt (1904) records a "Baum in den Staaten Amazonas und Pará Taromán benannt" and identifies it as "Citharexylon cinereum L.", but probably this is a misapplication of that binomial to C. poep-

pigii or some other Amazonian species of the genus. He describes the plant as having a "Steinfrucht mit saftigem Exokarp, wird von den Kautschuksammlern genossen".

López-Palacios and his associates describe C. poeppigii as an "Árbol erecto, inerme, 8--12 m. Tronco corto, 35 cm. de diámetro. Copa expansa, densa, 6--7 m. de diámetro. Hojas 3-verticiladas. Pedúnculos 3--5 cm., las adultas caedizas y rojo amarillentas; racimos arqueados; flores ligeramente pediceladas; ramas color castaño. Corola blanca o blanca cremósula. Drupas inmaturas rojo pálidas. Planta muy ornamental durante la fructificación".

In a letter to me, dated July 2, 1973, López-Palacios says: "Del material que le envío hoy 3156 corresponde exactamente a 2928 y 3157 corresponde exactamente a 2924. Pero sinceramente no creo que estas plantas sean la una variedad de la otra. Yo las considero especies diferentes por las siguientes razones: 3156 (C. poeppigii Walp.) - Árbol mediano, 6--10 m.; Tallos jóvenes castaños; Hojas caducas, las adultas amarillo rojizas; Inflorescencias multifloras; Flores pedunculadas; Corola de tubo largo y estrecho; Fruto maduro rojo, ápice obtuso. 3157 (Citharexylum sp.) - Árbol más alto, 12--15 m.; Tallos júvenes verde oscuro; Hojas siempre verdes (perennes?); Inflorescencias paucifloras; Flores sésiles; Corola de tubo corto y ancho; Fruto maduro verde amarillente, ápice apiculado. Ignore si 3157 pueda ser nuevo o pertenecer a C. venezuelense Moldenke, porque no conozco material típico de esta último taxon; pero si 3056 es C. poeppigii, con absoluta seguridad no se trata de una variedad sino de dos especies diferentes." I am regarding 3157 as C. poeppigii and 2928 & 3156 as C. venezuelense.

Dwyer (1971) cites Woytkowski 7116 from San Martín, Peru, while Macbride (1960) cites Klug 3943, Poeppig 2219, Schunke 365, Tessmann 3491, and Williams 261, 413, 7183, & 8030 from Loreto, Peru.

Material of typical C. poeppigii has been misidentified and distributed in some herbaria as C. poeppigii f. anomalum Moldenke. On the other hand, the Murça Pires 51847, distributed as C. poeppigii, is actually C. macrophyllum Poir.

Additional citations: COLOMBIA: Boyacá: Uribe Uribe 4049 (N). Méta: Barclay, Juajibioy, & Gama 3626 (W--2702419), 3637 (W--2702427); Garcia-Barriga, Hashimoto, & Ishikawa 18505 (N); Philipson, Idrobo, & Fernández 1380 (N); Plowman, Davis, & Jacobs 4278 (Ld). Putumayo: Soejarto, Vogelmann, Olday, & Hernández 1225 (Oa). VENEZUELA: Barinas: Veillon 78 (W--2654208). Bolívar: Ruiz-Terán & López-Palacios 11155 (Ld). Mérida: López-Palacios & Bautista 3180 (Ld). Táchira: López-Palacios 3157 (Ld); Steyermark & Rabe 86629 (N).

CITHAREXYLUM POEPPIGII f. ANOMALUM Moldenke

This taxon is now regarded as synonymous with C. venezuelense Moldenke, which see.

CITHAREXYLUM POEPPIGII var. CALVESCENS Moldenke

Additional bibliography: Moldenke, Phytologia 13: 302. 1966; Moldenke, Fifth Summ. 1: 115 (1971) and 2: 860. 1971; Moldenke, Phytologia 25: 228. 1973.

López-Palacios describes this plant (on the basis of his no. 2924) as an "Árbol de unos 12 m., con ramaificación a partir de los 3 m. Hojas opuestas con 2 o más glándulas en la base del limbo, cartáceas en los brotos jóvenes y con pecíolo hasta 15 mm., limbos hasta do 27 x 13 cm. en la parte más ancha; en las ramas adultas son coriáceas y mucho menores (16 x 7 cm.), glabras por la haz (a excepción de la nervadura), piloso-velutinosas por el envés. Frutos sésiles, obovoides ca. de 1.5 cm. de diámetro, de color verde cuando jóvenes, amarillo verduzco cuando maduros y marrón cuando secos, nunca rojos". He found it growing at 180 m. altitude, in fruit in October. The very large fruit may possibly indicate a new variety for this plant, especially since the collector asserts that the mature leaves are like those of typical C. poeppigii. In fact he says that the plant represented by this number (2924) is identical in all respects to his no. 3157 which I have determined as typical C. poeppigii.

Additional citations: VENEZUELA: Barinas: López-Palacios 2924 (Z).

CITHAREXYLUM POEPPIGII var. MARGARITACEUM Poepp. & Moldenke

Additional synonymy: Citharexylum poeppigii var. margaritaceum "Poepp. ex Moldenke" apud J. F. Macbride, Field Mus. Publ. Bot. 13 (5): 678. 1960.

Additional bibliography: R. C. Foster, Contrib. Gray Herb. 184: 169. 1958; J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 668, 670, & 678--679. 1960; Moldenke, Phytologia 14: 509. 1967; Moldenke, Fifth Summ. 1: 115, 135, 140, 148, 181, 434, & 435 (1971) and 2: 860. 1971.

Recent collectors have encountered this plant at 590 m. altitude, in fruit in September.

Macbride (1960) asserts that the "authority of [the] variety [was] published incorrectly, as Poeppig and Moldenke". However, the taxon was first recognized as distinct by Poeppig and he proposed the epithet "margaritaceum" for it on herbarium specimen labels, but then died before he had formally validated the name by formal publication. I later validated it by publication and by supplying a description in Latin as was required by the International Botanical Code at that time. According to the very much respected taxonomic botanist, H. A. Gleason, at that time Head Curator of the New York Botanical Garden and my superior and mentor, this situation justifies the linkage of the surname of the original author of the epithet with the surname of the validator. This I did and this is the policy which he also consistently followed in his lifetime of publications on the Melastomaceae and other groups of chiefly tropical South American plants.

Additional citations: COLOMBIA: Méta: García-Barriga, Hashimoto, & Ishikawa 18505 (W—2569312A).

CITHAREXYLUM PTEROCLADUM Donn. Sm.

Additional bibliography: Moldenke, Phytologia 13: 303. 1966; Gibson, Fieldiana Bot. 24 (9): 184 & 190—191. 1970; Moldenke, Fifth Summ. 1: 68, 78, 81, & 435 (1971) and 2: 860. 1971; Moldenke, Phytologia 23: 415 (1972) and 31: 337. 1975.

Recent collectors describe this species as a small tree or shrub, 7—17 m. tall, the trunk to 30 cm. in diameter at breast height, and the fruit red-pink or orange. They have found it growing in chaparral, acahual, high evergreen woods, and rainforests, on hilltops, and in deep black sandy soil with primary vegetation, at 20—1560 m. altitude, fruiting in February, April to June, and November. Martínez-Calderón refers to it as "abundant" in Veracruz, Mexico. The corollas are said to have been "blue" on Hinton 12631 & 13738. Contreras 6916 was annotated by someone, perhaps the collector, in the Austin herbarium as "n. sp.?"

Gibson (1970) comments that the species is "Closely related to the Mexican C. affine D. Don. Moldenke separates the two by such tenuous characters as whether the branches are 'always alate' or 'sometimes alate' and the leaf blades 'glanduliferous at the base' or 'usually not glanduliferous at the base'. The only constant difference is the smaller size of the flowers of C. affine, in which the corolla tube is only ca. 4 mm. long with lobes 2—3 mm. long [in C. pterocladum the tube is 5—6 mm. long and the lobes 4—5 mm. long]. Because they are so much alike in every other respect, the flowers of both were examined for heterostyly but in both the stigma at anthesis is just a little below the anthers."

Additional citations: MEXICO: Chiapas: F. Miranda 7734 bis (W—2508420). Michoacán: Hinton 12631 (Se—187215, Tu—98520), 13738 (Se—187218, Tu—112056), 13739 (Se—187239, Tu—112055). Veracruz: Calzada 284 (Ld), 355 (Ft); Martínez-Calderón 2202 [Rec. Inf. D004802] (Mi, Z); Sousa 3086 (Mi). GUATEMALA: El Petén: Contreras 6916 (Au—278537, Ld, Ld, Ld), s.n. [May 1967] (Ld).

CITHAREXYLUM PUNCTATUM Greenm.

Additional bibliography: R. C. Foster, Contrib. Gray Herb. 184: 169. 1958; J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 669, 670, 678, & 679. 1960; Moldenke, Phytologia 14: 509. 1967; Moldenke, Fifth Summ. 1: 140, 181, 382, & 435 (1971) and 2: 860. 1971; Troncoso, Darwiniana 18: 373, 375, & 408. 1974.

Ugent encountered this plant on a rocky slope with Solanum brevicaule, S. capsicibaccatum, S. acaule, Oenothera, Lupinus, Chenopodium, Salvia, Oxalis, Calceolaria, and non-tuberous Solanum spp., at 3800 m. altitude, in fruit in April. Macbride (1960) says of it: "Distributed as C. ilicifolium HBK.; differs in smaller entirely glabrous leaves, not spinose-dentate; the striking impressed punctation is diagnostic.....; a gnarled shrub, to 2 meters tall, of high (3,300—3,800 meters) altitude." He cites

only Weberbauer 935 from Puno, Peru, asserting that the species is also found in Bolivia.

Additional citations: BOLIVIA: Cochabamba: Ugent 4750 (Ws).

CITHAREXYLUM QUERCIFOLIUM Hayek

Additional bibliography: J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 668, 670, & 679—680. 1960; Moldenke, Phytologia 14: 510. 1967; Moldenke, Fifth Summ. 1: 140 & 430 (1971) and 2: 769 & 860. 1971.

Macbride (1960) comments: "Outstanding in the large coriaceous spiny serrate leaves......; seems probably [to be] an extreme variant of C. reticulatum HBK." He cites only Weberbauer 4248 from Cajamarca, Peru.

CITHAREXYLUM QUITENSE Spreng.

Emended synonymy: Citharexylum molle H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 208—209. 1817 [not C. molle Jacq., 1804. nor Salisb., 1796]. Citharexylon quitense Spreng. in L., Syst. Veg., ed. 16, 2: 763. 1825.

Additional & emended bibliography: H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 208—209 (1817) and ed. quarto, 2: 257—258. 1818; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 550. 1893; Barnhart, Bull. Torrey Bot. Club 29: 590. 1902; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 550. 1946; Anon., Commonw. Mycol. Inst. Ind. Fungi Petrak Cum. Ind. 2: 279. 1957; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 550. 1960; J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 673. 1960; Moldenke, Phytologia 13: 303—304. 1966; Moldenke, Fifth Summ. 1: 135, 430, & 434 (1971) and 2: 860. 1971; Moldenke, Phytologia 31: 347. 1975.

Recent collectors describe this plant as a tall shrub, about 3 m. tall, the buds rather dark-yellow, the corollas yellowish-white, and have encountered it in thickets, flowering in January and fruiting in February and March.

The H.B.K. references cited in the synonymy and bibliography above were authenticated by the late Dr. J. H. Barnhart (1902).

Additional citations: ECUADOR: El Oro: Asplund 15682 (N). Guayas: Asplund 15233 (N, W—2652448), 15323 (N).

CITHAREXYLUM RACEMOSUM Sessé & Moc.

Additional bibliography: Moldenke, Phytologia 13: 304. 1966; Moldenke, Fifth Summ. 1: 68 & 474 (1971) and 2: 860. 1971.

Smith and his associates refer to this plant as a shrub, 2.5 m. tall, with orange-red "berries" [actually they are drupes], and encountered it in gravelly gray or brown soil in the thorn-scrub-cactus formation, at 1000 m. altitude, fruiting in July.

Additional citations: MEXICO: Puebla: Smith, Peterson, & Tejeda 4121 (N).

CITHAREXYLUM RECURVATUM Greenm.

Additional & emended bibliography: Prain, Ind. Kew. Suppl. 4, imp. 1, 49 (1913) and imp. 2, 49. 1958; Moldenke, Phytologia 9: 11—

12. 1959; Moldenke, Fifth Summ. 1: 87, 90, 357, & 437 (1971) and 2: 860. 1971; Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 93, 99, & 145. 1973; Moldenke, Phytologia 31: 351 & 352. 1975.

Recent collectors describe this species as a tree, to 50 feet tall, with shiny, orange-colored fruits in July.

The P. H. Allen 4730, M. E. Davidson 899, P. White 214, and Woodson, Allen, & Seibert 870, distributed as C. recurvatum and previously so cited by me in previous installments of this series of notes, are all actually C. donnell-smithii Greenm., while P. White 223 is C. viride Moldenke.

Additional citations: PANAMA: Chiriquí: Blum & Dwyer 2577 (E--1840171).

CITHAREXYLUM REITZII Moldenke

This taxon is now known as Verbenoxylum reitzii (Moldenke) Troncoso.

CITHAREXYLUM RETICULATUM H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 208. 1817 [not C. reticulatum Cham., 1909, nor Donn. Sm., 1907].

Additional & emended bibliography: H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 208 (1817) and ed. quarto, 2: 257. 1818; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 550 & 823. 1893; Barnhart, Bull. Torrey Bot. Club 29: 590. 1902; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 550 & 823. 1946; Douin, Ann. Univ. Lyon, ser. 3, C.8: 82. 1954; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 550 & 823. 1960; J. F. Macbr., Field Mus. Publ. Not. 13 (5): 669, 670, 677, & 680. 1960; Moldenke, Phytologia 13: 304. 1966; Hocking, Excerpt. Bot. A.11: 504. 1967; Moldenke, Biol. Abstr. 49: 4199. 1968; Moldenke, Fifth Summ. 1: 135, 140, 357, 430, & 436 (1971) and 2: 491, 766, 768, & 860. 1971; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 15: 19. 1975; Moldenke, Phytologia 31: 381. 1975.

It should be noted here that the H.B.K. corrected dates cited above have been authenticated by Barnhart (1902).

Macbride (1960) cites Weberbauer 6604 from Junín and Ferreyra 10426 from Lima, Peru. However, I regard the Weberbauer collection as representing C. laurifolium Hayek. Douin (1954) records C. reticulatum as cultivated in France.

The López-Palacios collection cited below is placed here tentatively. It is sterile and its leaves are much larger and differently shaped than those of Ferreyra 10426, previously cited as representing this species. López-Palacios describes his plant as an "arbolito baho de unos 3 m. Hojas de envés glabro, excepto en la nervadura. Aréolas punteadas."

The Greenman & Greenman 5227, distributed as C. reticulatum, is actually Aegiphila panamensis Moldenke.

Additional citations: COLOMBIA: Antioquia: López-Palacios 3588 (Z).

CITHAREXYLUM RETIFORME Engelhardt

Additional bibliography: Moldenke, Phytologia 7: 15. 1959; Moldenke, Fifth Summ. 1: 375 & 430 (1971) and 2: 860. 1971.

CITHAREXYLUM RIGIDUM (Briq.) Moldenke

Additional & emended bibliography: Briq. in Chod. & Hassl., Bull. Herb. Boiss., ser. 2, 4: 1166. 1904; Briq. in Chod. & Hassl., Pl. Hassler. 2: 502. 1904; Fedde & Schust. in Just, Bot. Jahresber. 60 (2): 571. 1941; Moldenke, Phytologia 13: 310. 1966; Moldenke, Fifth Summ. 1: 148, 185, 434, & 436 (1971) and 2: 860. 1971.

CITHAREXYLUM RIMBACHII Moldenke

Additional bibliography: Moldenke, Phytologia 7: 17-18. 1959; Moldenke, Fifth Summ. 1: 135 (1971) and 2: 860. 1971.

CITHAREXYLUM ROSEI Greenm.

Additional bibliography: Prain, Ind. Kew. Suppl. 4, imp. 1, 49 (1913) and imp. 2, 49. 1958; Moldenke, Phytologia 13: 310--311. 1966; Moldenke, Fifth Summ. 1: 68, 357, & 436 (1971) and 2: 617 & 860. 1971.

Recent collectors describe this plant as a shrub, 2--2.5 m. tall, and have encountered it in "ladera riolitica con vegetación de matorral xerófilo", at 1700 meters altitude, flowering in June. The corollas are said to have been "whitish" on _J. Rzedowski 10720_, a collection exhibiting remarkably narrow leaves for this taxon.

The _J. Rzedowski 24607_, distributed as _C. rosei_, is actually var. _pilosum_ Moldenke.

Additional citations: MEXICO: Guanajuato: _H. H. Rusby 43_ (W--2676521). San Luis Potosí: _J. Rzedowski 10720_ (Ip, Mi), _10740_ (Ip, Mi, Ws). Zacatecas: _R. McVaugh 17670_ (Ip).

CITHAREXYLUM ROSEI var. DURANGENSE Moldenke

Additional bibliography: Moldenke, Phytologia 13: 311. 1966; Moldenke, Fifth Summ. 1: 68, 357, & 436 (1971) and 2: 617 & 860. 1971.

CITHAREXYLUM ROSEI var. PILOSUM Moldenke

Additional bibliography: Moldenke, Phytologia 13: 311--312. 1966; Moldenke, Fifth Summ. 1: 68 (1971) and 2: 860. 1971.

Rzedowski describes this plant as a shrub, 1.5 m. tall, and found it growing on "ladera caliza" with low matorral vegetation of _Karwinskia_ and _Condalia_, flowering in September. The corollas are said to have been "white" on _J. Rzedowski 24607_.

Additional citations: MEXICO: Jalisco: _R. McVaugh 17152_ (N--type). San Luis Potosí: _J. Rzedowski 24607_ (Ip, Mi).

CITHAREXYLUM ROXANAE Moldenke

Additional bibliography: Moldenke, Phytologia 13: 312. 1966;

G. Taylor, Ind. Kew. Suppl. 14: 34. 1970; Moldenke, Fifth Summ. 1: 68 (1971) and 2: 860. 1971.

Collectors describe this plant and its habitat as follows: (1) shrub with many slender branches fanning out from the base, about 1.5—2 m. tall and 2 m. broad, the falling leaves turning reddish, the fruits maturing through brick-red to almost black, growing with low Alternanthera, Mimosa purpurascens, Jatropha vernicosa, Euphorbia, and Aralia scopulorum on steep north-facing slope near crest of ridge, on the south side of Valle de Los Encinos (south side of Cerro Giganta), Sierra de la Giganta, altitude about 1050 m., lat. ca. 26°3.5' N., long. 111°34' W,; (2) virgately branched, striate stems up to 2 m. long, the flowers dried up, apparently did not set fruit, near spring, with scattered Ficus palmeri, Celtis reticulata, Quercus tuberculata, Erythrina flabelliformis, Mimosa purpurascens, Bursera microphylla, Lophocereus schottii, Lemaireocereus thurberi, Hyptis emoryi, and Aloysia barbata on north-facing canyon and ridge, south side of Valle de Los Encinos (south side of Cerro Giganta), Sierra de la Giganta, alt. about 780—900 m.; (3) shrub 3 m. tall with many slender broom-like branches terminating main erect stems, growing with Pachycormus, Franseria arborescens, Jatropha vernicosa, and Schaefferia on steep talus on north-facing slope, peak south of Portezuelo de Peloteado (southwest of Notrí), Sierra de la Giganta, altitude about 950--1200 m., ca. lat. 25°49' N., long. 111°23' W. — at the Portezuelo de Peloteado (or de la Victoria), altitude about 800 m., the rugged eastern escarpment of the sierra drops abruptly to the Gulf; to the west the sierra slopes gently to the Arroyo de Santo Domingo drainage. The dominant vegetation of the "portezuelo" is low Jatropha cuneata, with scattered Lemaireocereus thurberi and Machaerocereus gummosus. The peaks to the north and to the south rise to 1200 meters or more, On steep north- and northeast-facing slopes at the base of cliffs are Mimosa purpurascens, Lysiloma divaricata, Amyris, Jatropha vernicosa, Bernardia, Pachycormus, Karwinskia, Alvordia, Franseria arborescens, and occasional Erythea brandegeei and Quercus tuberculata; (4) spreading broom-like shrub, about 1.5 m. tall, the branches in 3's, flowers creamy-white, salverform, pubescent within, growing in steeper slopes, only a few shrubs seen, on gentle north-facing slopes of Cerro Gabilán, south of Portezuelo de Gabilán, altitude about 870 meters, Sierra de la Giganta, ca. lat. 25°50 3/4' N., long. 111°25' W.; Portezuelo de Gabilán (altitude about 720 m.) lies between Cerro Gabilán to the south and Cerro Teombó to the north; the ascent from the west via Arroyo de los Dolores is gradual. To the east there is a precipitous drop into Cañon Gabilán. The sparse vegetation cover of the Portezuelo is comprised of Cercidium praecox, Opuntia cholla, and Machaerocereus gummosus, as well as scattered Lemaireocereus thurberi, Pachycereus, and 3 species of Bursera; the north-facing slopes of Cerro Gabilán first ascend gradually and then are broken by vertical cliffs; on

these slopes one finds Fouquieria diguetii, Mimosa purpurascens, Lysiloma candida (L. divaricata at the higher elevations), Bursera, Jatropha cuneata, J. vernicosa, Pachycormus discolor, Cordia brevispicata, and Alvordia glomerata.

Moran refers to this obviously very rare and local species as a shrub, 4 m. tall, and encountered it at 1400 meters altitude.

Additional citations: MEXICO: Baja California: A. Carter 4123 (Au--271010, Mi, W--2539496), 4385 (Mi, N), 5083 (Au--271008, Mi, W--2539497); Carter & Ferris 4000 (W--2539495--isotype); Carter & Leal 4682 (N, W--2539498, Ws); R. V. Moran 11725 (Sd--59507).

CITHAREXYLUM SCABRUM Sessé & Moc.

Additional bibliography: Moldenke, Phytologia 13: 312. 1966; Moldenke, Fifth Summ. 1: 68, 429, 430, 432, 433, 436, & 474 (1971) and 2: 860. 1971.

CITHAREXYLUM SCHOTTII Greenm.

Additional synonymy: Citherexylum schottii Greenm. apud Roys, Ethno-bot. Maya 284 & 319, sphalm. 1931.

Additional bibliography: Prain, Ind. Kew. Suppl. 4, imp. 1, 49. 1913; Roys, Ethno-bot. Maya [Tulane Univ. Mid. Am. Res. Ser. Publ. 2:] 249, 284, & 319. 1931; Prain, Ind. Kew. Suppl. 4, imp. 2, 49. 1958; Moldenke, Phytologia 13: 312. 1966; Moldenke, Fifth Summ. 1: 68, 87, 357, 430, 435, & 438 (1971) and 2: 860. 1971; Anon., Biol. Abstr. 56 (2): B. A. S. I. C. S.52. 1973; Moldenke, Biol. Abstr. 56: 653. 1973; Moldenke, Phytologia 25: 368. 1973; Hocking, Excerpt. Bot. A.23: 293. 1974.

The Lundells report finding this plant growing "in a dooryard", but whether wild or cultivated is not specified. The corollas are said to have been "pale-green" on Lundell & Lundell 7878.

Roys (1931) records two Mayan names for this plant and describes the native uses as follows: "'Tatak-che'....[literally, clinging tree or that which clings to a tree]....This vine....is cooling. It is the ivy of Castile which winds about a tree; it pulls down a wall and disintegrates it. The Indian women employ the word tatakche to call to their husbands not to leave them, and it is a more decent expression than another one which they are accustomed to use. With it they cure sores, even though they are chronic, and it is necessary to learn the method of treatment, because it brings forth humors." This description is difficult to reconcile with that of C. schottii, which is said to be a shrub or tree [Standl., p. 1241]. The description quoted above is taken originally from "Yerbas y Hechicerias del Yucatán" f. 357r.

For "ixim-che" Roys (1931) says "A certain plant or shrub.... This tree, iximche, is moderately cooling. It is thus named, which means maize-tree, because it bears a fruit like maize. With it they cure a dangerous swelling called "chacmulahkak in this land.....Dr. Standley reports that the U. S. National Herbarium has two plants from British Honduras accompanied by the name,

ixim-che. One is C[asearia] nitida, and the other is Andira inermis, H.B.K. Neither particularly resembles maize, but the former is a shrub or small tree. The Maya texts give ic-che as a synonym and prescribe an infusion of the young leaves taken internally, or a decoction of them as a bath to cure asthma and coughs... The crushed leaves are also taken for cramps....The crushed root is applied externally for syphilitic sores....., erysipelas..... and the dangerous swelling mentioned above....One text refers to the red part of the plant." Roys seems to think that Citharexylum schottii is the plant referred to here, but how it bears any resemblance to maize or could be called a vine is not clear to me.

Additional citations: MEXICO: Yucatán: Enriquez 711 (W—2597476), 737 (W—2597478); Gaumer 765 (Tu—124702); Lundell & Lundell 7878 (N, Ws).

CITHAREXYLUM SCHOTTII var. PUBESCENS Moldenke, Phytologia 25: 368. 1973.

Bibliography: Anon., Biol. Abstr. 56 (2): B.A.S.I.C. S.52. 1973; Moldenke, Biol. Abstr. 56: 653. 1973; Moldenke, Phytologia 25: 368. 1973; Hocking, Excerpt. Bot. A.23: 293. 1974.

This variety differs from the typical form of the species in having its branchlets, peduncles, pedicels, flowering calyces, petioles, and lower leaf-surfaces uniformly short-pubescent.

Citations: GUATEMALA: Sacatepéquez: Webster, Adams, Miller, & Miller 11813 (Mi—type, Z—isotype).

CITHAREXYLUM SCHULZII Urb. & Ekm.

Additional & emended bibliography: A. W. Hill, Ind. Kew. Suppl. 8: 53. 1933; Fedde & Schust. in Just, Bot. Jahresber. 57 (2): 401. 1938; Moldenke, Phytologia 13: 312. 1966; Moldenke, Fifth Summ. 1: 102 (1971) and 2: 860. 1971.

Liogier describes this plant as a low shrub, 0.5—1.5 m. tall, much branched, the branches spreading, the flowers white and fragrant, and the fruits red or red-orange. He encountered it in pine barrens, pine forests on limestone and bauxite, and among limestone rocks at the edges of cliffs or in exposed positions near the rim of gorges, at altitudes of 1000—1300 meters, flowering in February, and fruiting in February and July. Liogier 14126 is accompanied by a color photograph in the Britton Herbarium.

Additional citations: HISPANIOLA: Dominican Republic: A. E. Liogier 13661 (N, Z), 13799 (Ld, N), 14126 (Ac, N), 17893 (N, W—2649065); Liogier & Liogier 19649 (N); Marcano s.n. [Herb. Jiménez 5267] (Ac, N, W).

CITHAREXYLUM SESSAEI D. Don

Additional & emended bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 550 (1893) and imp. 2, 1: 550. 1946; Metcalfe & Chalk, Anat. Dicot. 1032. 1950; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 550. 1960; Moldenke, Phytologia 14: 510. 1967; El-Gazzar & Wats., New Phytol. 69: 483 & 485. 1970.

[to be continued]

Alma L. Moldenke

"FERNS OF THE VICINITY OF NEW YORK: Being Descriptions of the Fern-plants Growing Naturally within a Hundred Miles of Manhattan Island" by John Kunkel Small, 285 pp., illus., Facsimile Edition for Dover Publications, Inc., New York, N. Y. 10014. 1975. $3.50 paperbound.

The original of this unabridged replication was published 40 years ago. The author, then on the staff of the New York Botanical Garden, prepared this study for the grateful amateurs and professionals among the Torrey Botanical Club members for use in their field and herbarium studies. The illustrations are still of excellent help as are also the careful descriptions. At the back of the book are good full index, author citation list with dates and abbreviations, concise glossary, and a specially valuable comparison of the generic and specific names used herein with those of the 7th edition of Gray's Manual (1908) and those of the 2nd edition of Britton & Brown's Illustrated Flora (1913). Probably 4 more pages will be interleaved here by users who want to bring this material even further up-to-date taxonomically.

This inexpensive edition makes it easily possible for students and naturalists to have an extra copy for field use.

"BIOMECHANICS" by R. McNeill Alexander, 62 pp., illus., Chapman & Hall, London EC4P 4EE, Halsted Press of John Wiley & Sons., Inc., New York, N. Y. 10016. 1975. $3.45 paperbound.

This is an interesting and helpful addition to the "Outline Studies in Biology" edited by Prof. Ainsworth of the University of Leeds. These guidebooks develop their main value not be repeating and telescoping texts but rather by summarizing the gaps in interdisciplinary fields between the standard texts and the research papers for the student and the intelligent reader. This one covers the application of engineering principles of mechanics to animal locomotion, plant sap rising, stomata opening, and to cell part movements.

"HANDBOOK OF PLANT AND FLORAL ORNAMENT: Selected from the Herbals of the Sixteenth Century and Exhibiting the Finest Examples of Plant-Drawing Found in those Rare Works, whether Executed in Wood-Cuts, or in Copperplate Engravings, Arranged for the Use of the Decorator with Supplementary Illustrations and Some Remarks on the Use of Plant-form in Design" by Richard

G. Hatton, ix & 539 pp., illus., Facsimile Edition for Dover Publications, Inc., New York, N. Y. 10014. New printing of 1960 edition. $5.00 paperbound.

Originally published in 1909 as "The Craftsman's Plant-Book: or Figures of Plants", this attractive reproduction of 1200 figures of flowering and fruiting plants is now easily available to plant-lovers, botanists, bibliophiles, the herbalist-minded, art historians, as well as the varied designing craftsmen.
The subtitle describes it well.

"AMERICAN MEDICINAL PLANTS: An Illustrated and Descriptive Guide to Plants Indigenous to and Naturalized in the United States Which are Used in Medicine" by Charles F. Millspaugh, xxii & 806 pp., illus., Facsimile Edition for Dover Publications, Inc., New York, N. Y. 10014. 1974. $10.00 paperbound.

The original, larger sized, 2-volumed work with 180 exquisitely colored and accurately drawn plates was published in 1892 as "Medicinal Plants" and is to this day a highly creditable work because the author was outstanding in personal endowment, medical training and skills, in artistic skills, and in field and pharmaceutical botany. This single volumed replication is unabridged except for (1) the decrease in the margins, (2) a 1/6 size reduction of those 180 plates that even in their black/white form are still readily recognizable and very attractive, (3) the addition of a new table of revised classification and nomenclature by F. S. Harrar, and (4) continuous pagination added next to the original.
This is a model that the "herb-healers", naturopaths, etc. could well study for its careful scientific presentation if they insist on writing health care information despite modern advances.

"THE FILAMENTOUS FUNGI. Volume I. Industrial Mycology" edited by John E. Smith & David R. Berry, xii & 340 pp., illus. Edward Arnold Publishers Ltd., London W1X8LL & Halsted Press of John Wiley & Sons Inc., New York, N. Y. 10016. 1975. $37.50.

Twenty different authors , including the editors and mostly from the British Isles — home of penicillin — have provided well planned chapters of value and interest to mycologists, biology teachers, advanced students and technicians in pharmaceutical biochemical and food research laboratories and industries. The first 5 chapters provide a solid academic treatment of the structure, development, primary and secondary metabolic pathways and genetics of these multicellular fungi. Following are 11 chapters on the historical development of the fungal fermentation industry and present day commercial production of organic acids, enzymes, gibberillins, griseofulvins, terpenoids, the cultivation

of edible mushrooms, millenia-old Oriental food fermentation processing, ergot alkaloids, myxotoxins and fungal biodegredation.

This is the first comprehensive survey in this broad field, and is certainly a very good one.

"A GUIDE TO THE MEDICINAL PLANTS OF THE UNITED STATES" by Arnold & Connie Krochmal, vi & 259 pp., illus., Quadrangle: The New York Times Book Company, New York, N. Y. 10022. 1975. $4.95 paperback.

This is the first paperback printing of the excellent original cloth hard-covered issue of 1973 listed at $12.50. In PHYTOLOGIA 31 (4): 365 it was recommended highly for its "interesting, valuable and well documented information.....written by capable botanists long interested in this field." It is indeed good that there is more call for this well illustrated book since the book market is almost glutted with inaccurate, sloppy and pseudoscientific stuff.

"FLORA BALEARICA — Étude Phytogéographique sur les Isles Baléares" 4 volumes by Herman Knoche, 1643 pp., illus., Reprint edition by Otto Koeltz Science Publishers, Koenigstein D-624, West Germany. 1974.

Since these Spanish islands (with Mallorca, Minorca and Ibiza being the best known) in the western Mediterranean Sea have provided interesting sites for exploration, salvage for shipwrecks, agriculture, vacationing, and thoroughfare between southern Europe and northwestern Africa in both directions, it is not unexpected that these Mediterranean islands have few endemic plants and many characteristic of the mediterranean area in general.

The most extensive record of the most thorough plant collecting on these islands is this classic first published as follows: Volume I (534 pp., illus.) 1921 and Volume II (554 pp., illus.) 1922. Herein are recorded the full floristic data and the several collections of all kinds of plants on all the islands. Volume III (xv & 411 pp., illus.) Partie Général 1923 is a very detailed phytogeographic, geological, and palaeophytological account with plant association relationships, cultivation influences, and a set of comparisons and contrasts. Volume IV (100 pp., illus.) 1923 consists of a list of the 47 plates, each usually with two fine old photographs of the individual plants or association groups.

Anyone seriously or temporarily interested in this whole mediterranean area can now fortunately have easier access to this fundamental study.

"TREES OF PUERTO RICO AND THE VIRGIN ISLANDS" 2nd Volume by Elbert L. Little, Jr., Roy O. Woodbury & Frank H. Wadsworth, xiv & 1024 pp., illus., United States Government Printing Office, Washington, D. C. 20402. 1974. $13.45.

Since this excellent study has been published as the Agricultural Handbook No. 449 by the United States Department of Agriculture, Forest Service, it can be marketed at a bargain price. The same is true of the few remaining copies of the earlier volume entitled "Common Trees of Puerto Rico and the Virgin Islands" by the first- and last-mentioned of the above authors. It is Agriculture Handbook No. 249 (1964) and sells for $8.50.

To the 250 native and introduced species drawn, described, and supplied with other pertinent data (range, common names, synonymy, uses, effects) in Volume I has been added similar data and clear line drawings for 460 additional species and brief notes on 40 others in Volume 2, Agricultural Handbook No. 449. Either volume may be used independently of the other.

"THE CATHARANTHUS ALKALOIDS: Botany, Chemistry, Pharmacology, and Clinical Use" edited by William I. Taylor & Norman R. Farnsworth, vii & 323 pp., illus., Marcel Dekker Inc., New York, N. Y. 10016. 1975. $29.50.

This book is offset printed from the typed page as is the earlier similar work on the alkaloids of the related apocynaceous genus Vinca and like it is planned for research scientists and their advanced students in any of the fields indicated in the subtitle and in any interdisciplinary ones.

What guarantees validity in these two studies is the synopsis of each genus and its species, range, synonymy, etc., by an outstanding taxonomic botanist acquainted with the relevant literature in history, medicine, etc. — William T. Stearn. With such boundary lines respected. the nine specialists, including the editors, discuss the biochemistry and pharmacology of C. roseus and other species of lesser importance, the bis indole or dimeric alkaloid structure and biochemistry, tissue (callus) culture, and their clinical aspects as "most valuable agents used in cancer chemotherapy", a palliative single agent in several advanced neoplasms, and in combination chemotherapy.

The index and the bibliographies give access to topics and to the numerous authors' citations. Excellent charts and molecular models add much to the understanding of this important study.

"MALEZAS PREVALENTES DE AMERICA CENTRAL: PREVALENT WEEDS OF CENTRAL AMERICA" By José Guadalupe L. García, Bruce MacBryde, Antonio R. Molina & Olga Herrera-MacBryde, ii & 162 pp., illus., International Plant Protection Center, El Salvador, San Salvador & Oregon State University, Corvallis, Oregon

97331. 1974.

This is a completely bilingual useful publication that shares the expected advantages and disadvantages of such an international effort. For 277 subtropical, tropical and temperate virtually cosmopolitan weeds there are provided color photographs, common names and detailed identifiable descriptions. The plants are indexed by all names, arranged by families and the families by alphabet.

The plants color photographed on a darker blue background offer more color contrast than those on a red background — often of a same color intensity. A sky-blue background would have been more attractive, more effective in contrast and more natural. The details of the plant structures should be more distinct. The photograph labeled Lippia strigulosa (syn. Phyla reptans) actually depicts the related but distinct Phyla nodiflora, for which a synonym is Lippia nodiflora.

A bilingual key to all these weeds will be published separately by the MacBrydes. The plants involved are obviously not in need of any protection. Where man has disturbed the ground and its original plant and animal cover these "urchins take over", protecting the soil beneath in what is usually a most efficient manner.

"PHYSICAL ASPECTS OF SOIL WATER AND SALTS IN ECOSYSTEMS" edited by A. Hadas, D. Swartzendruber, P. E. Rijtema, M. Fuchs & B. Yaron, xvi & 460 pp., illus., Chapman & Hall Ltd., London & Springer-Verlag, Heidelberg, Berlin, & New York, N. Y. 10010. 1973. $38.60.

These useful papers were presented at the symposium sponsored by the International Society of Soil Sciences on "Soil Water Physics and Technology" in Israel in 1971: they are incorporated as Volume 4 in the Ecological Studies series. They deal with theoretical and practical aspects of water flow in soils, energy of soil water as chemical potential, evapotranspiration and crop-water requirements, and salinity control. Each paper provides its own bibliography, figures and neat presentation. The subject index reeks with sins of omission and commission!

"WILDFLOWERS OF THE SOUTHEASTERN UNITED STATES" by Wilbur H. Duncan & Leonard E. Foote, ii & 296 pp., illus., University of Georgia Press, Athens, Georgia 30602. 1975. $12.00.

Easier to carry about and to purchase than Rickett's beautiful Volume 2 of "Wild Flowers of the United States", less taxing intellectually than the now reissued Small's classic "Flora of the South Eastern States", and sponsored by the Garden Club of Georgia and the country-bred Georgia Governor J. Carter, this

carefully prepared (almost unkeyed) field guide will be a great help in identifying 485 attractively photographed wildflowers and even more than this number again of closely resembling species.

"The text gives for each species its common and scientific names, recognition characteristics, abundance, ecological and geographical distribution, flowering period, and often scientific names previously used. Special information is sometimes inserted to denote economic value."

"METHODS OF STUDYING PLANT WATER RELATIONS" edited by Bohan Slavík, xviii & 449 pp., illus., Academia Publishing House of Czechoslovak Academy of Sciences, Prague & Springer-Verlag, Heidelberg, Berlin, & New York, N. Y. 10010. 1974. $31.20.

In this exceptionally fine Ecological Studies series this is no. 9 and continues in the same tradition. For the methods and techniques carefully explained as to their theoretical basis, their really detailed descriptions of procedures and equipment, and the significance of their results, this book gives the most comprehensive treatment, omitting sensibly only peripheral interests already well covered in accessible literature. Its scope is from laboratory to field, from highly complicated to simple, from very precise to approximate. The following major topics are considered: (1) water in cells and tissues — often with a hydration deficiency which represents the driving force for water flux through all parts of the plant, (2) water content — from long used drying techniques to root-bridging and newer physiological and biochemical testing of drought damage, (3) water exchange between plant roots and soil — as it normally moves from the latter to the former along a gradient of decreasing H_2O potential, (4) liquid water movement in plants, and (5) water exchange between plant and atmosphere, checking stomatal control, guttation and transpiration.

Most of these papers have been translated from Czech, making them more universally readable. Well over a thousand references are given in the bibliography. The many charts and diagrams add appreciably to comprehension and use.

"GROWING VEGETABLES IN THE HOME GARDEN" by Robert E. Wester, ii & 123 pp., illus., Facsimile Edition by Dover Publications Inc., New York, N. Y. 10014. 1975. $1.35 paperbound.

Direct, simple, careful, and therefore helpful, this work was first published in 1972 as the Home and Garden Bulletin 202 of the United States Department of Agriculture and is here neatly replicated. It covers effectively site selection and arrangement, soil preparation, seed selection and germination, garden planting and care with practical directions for over 50 vegetables.

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A REVISION OF THE GENUS ARCHIBACCHARIS HEERING. (COMPOSITAE - ASTEREAE)

John D. Jackson
Department of Botany, University of Minnesota, St. Paul

Abstract

Twenty-eight taxa of Archibaccharis are treated, these recognized as twenty-two species with nine varieties. The range of the genus is from northern Mexico to central Panama. Extensions of the known ranges are reported for many of the taxa.

The genus is recircumscribed and divided into two sections. An older name whose validity was previously unrecognized is now cited for the type species of Archibaccharis.

Two taxa are accorded new status and one variety is placed in synonymy. One new combination is reported. One species and one variety are described as new. One name was removed from the genus. Pistillate or staminate specimens of six taxa are described for the first time. One species is reported as probably being monoecious.

Chromosome data is provided for sixteen taxa. New evidence of evolutionary significance is reported.

Taxonomic literature, vernacular names, geographical distribution, morphology, generic-intergeneric relationships, evolution, cytological and pollen data are discussed.

New keys, distribution maps and ecological data as well as floral and chromosome illustrations are included.

Acknowledgements

This paper is based on a thesis submitted to the Faculty of the Graduate School of the University of Minnesota, Minneapolis, Minnesota, in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

My work was completed under the direction of Dr. Gerald B. Ownbey, my major professor. I am deeply grateful for his concern, support and advice on innumerable occasions throughout the study.

I am indebted to the curators of the various herbaria who have generously loaned me specimens for study. I wish especially to thank the curators and/or directors of their respective institutions for courtesies extended to me during my visits: Dr. Lewis O. Williams, Chicago Natural History Museum, Chicago; Dr. Lorin I. Nevling Jr., Gray Herbarium,

Harvard University, Cambridge; J. P. M. Brenan and Dr. Raymond Harley, Herbarium and Library, Royal Botanic Gardens, Kew, Richmond; J. E. Dandy, the British Museum, London; Mlle. Alicia Lourteig, the Muséum National d'Histoire Naturelle, Paris; Dr. C. E. B. Bonner, Conservatoire et Jardin Botaniques, Genève.

Mr. Richard Hanley assisted me with the Latin portions of the work which was reported in a preliminary publication. Permission was granted for use of the base maps, copyright by the University of Chicago Department of Geography. My wife, Helen, assisted me with the floral drawings and accompanied me on the second journey to Mexico and Central America. To all those who have provided help and encouragement, I express my sincere appreciation.

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Introduction

The genus Hemibaccharis was described by Blake (1924) to encompass a group of species "perplexingly intermediate between Baccharis and Conyza" which had "long afforded difficulty to botanists." All of the species of Hemibaccharis were subsequently transferred to the genus Archibaccharis by Blake (1926, 1927).

Following preliminary survey of the literature by the writer in 1967, it was apparent that a considerable amount of basic work could be undertaken, which if successful, might establish a firmer foundation for retention of the genus Archibaccharis. Many taxa were represented in herbaria by a single or only a few collections. Fourteen new taxa described since Blake's work on Hemibaccharis had never been included in a key. The lack of either the pistillate or staminate specimens for many of the taxa as well as the complete absence of any chromosome or pollen data made evident the need for further field work. New keys, the first distribution maps and new ecological data could now be prepared from the more recent and abundant collections available. The need for the present revision was thus evident.

My study of Archibaccharis is based on field and herbarium studies extending over more than three years. The major descriptive portions of the work have been based on the study of my own specimens and approximately 1,900 specimens borrowed from nineteen herbaria in the United States and Europe. Two extensive field trips were made to Mexico and Central America in 1968 and 1969. On the latter trip, seventeen taxa of the genus were collected. Cytological and fruiting materials were collected and used in the determination

of thirteen new chromosome counts. Pollen grains were described and measured. During the summer of 1970, many historical type collections were personally studied at the following institutions: Gray Herbarium, Cambridge, Massachusetts; Royal Botanic Gardens, Kew, Richmond, England; British Museum, London, England; Museum of Natural History, Paris, France; Herbarium and Botanical Gardens, Genève, Switzerland.

The present revision treats all species and varieties of Archibaccharis insofar as known. Further information of a basic nature is still needed for many of the taxa. It is also hoped that future investigations will provide new information regarding hybridization, pollination, biological species limits and chemical constituents.

Taxonomic History of Archibaccharis

Because the range of the genus Archibaccharis is restricted mostly to the high regions of Mexico and Central America, no reference to any species now assigned to this genus is made in pre-Linnaean literature.

The first descriptions of plants now referred to Archibaccharis were supplied by Kunth (1820) when he described Baccharis serratifolia, B. mucronata and B. micrantha. The The three species have since been shown to be conspecific (Blake, 1930). Many additional species described later were also placed in the Linnaean genus Baccharis because of the obvious morphological similarities to that genus. Other species now referred to Archibaccharis were originally described under Conyza, Diplostephium and Pluchea.

Heering (1904) was the first to recognize the genus Archibaccharis. Blake (1924, pp. 543-554) circumscribed the same genus as Hemibaccharis but in doing so he overlooked Heering's genus Archibaccharis. Blake was informed of his oversight by Dr. Johann Mattfeld of Berlin and Blake (1926, pp.1507-1509; 1927, pp. 60-61) subsequently made the appropriate transfers from the genus Hemibaccharis to the genus Archibaccharis. Blake's early treatment included a key to ten taxa transferred to Hemibaccharis from other genera and six new species described by him. Two additional taxa were listed as doubtful. This early work was somewhat limited because of the paucity of collections from Mexico and Central America. Blake probably deserves to be recognized as the first monographer of the genus since he was the first to bring together all of the previous information including most of that published by Heering even though that work was unknown to him. During the years 1929-1943, Blake described ten new taxa belonging to Archibaccharis. A. Blakeana was described by Standley and Steyermark (1940). The last species to be described before this writing was

A. lucentifolia (Williams, 1962).

The etymology of the two generic names applied to the group has been explained by their respective authors. Heering (1904, p. 39) observed that constant differences were found in the pistillate heads when comparing the heads of some Baccharis species. He decided to name a new genus "since we can imagine the completely dioecious Baccharis species to have evolved from similar forms." Blake (1924, p. 544) proposed to call the genus Hemibaccharis "in allusion to the fact that the staminate plant is indistinguishable from Baccharis." The differences, as viewed by Blake, were to be found in the pistillate heads of Archibaccharis, referring principally to the constant presence of the central disk flowers.

The restudy of the taxa assigned to Archibaccharis has resulted in the recognition of twenty-two species with nine varieties in the present work.

Generic-Intergeneric Relationships and Evolution

Archibaccharis is placed in the Tribe Astereae which is characterized by having all or only the central flowers tubular; the disk flowers are commonly yellow and the anthers are basally blunt. The style branches are hispidulous outside and the stigmatic lines reach nearly to the apices.

Archibaccharis resembles both Conyza and Baccharis in habit and morphology. Conyza is distinguished by its herbaceous habit and heterogamous, functionally gynomonoecious heads. The marginal flowers are filiform and pistillate. The central disk flowers possess functional anthers and fertile achenes. Baccharis is a normally dioecious genus composed mostly of shrubs. Ordinarily in Baccharis the pistillate heads are composed entirely of fertile filiform flowers with 5-10 nerves on the achenes. The staminate heads are composed of disk flowers with functional anthers but abortive, reduced achenes. A few cases of exceptional heterogamous heads have been reported. Cassini (1825, p. 479) reported subdioecious heads for Baccharis scoparia Schwartz, a Jamaican species. Several instances of the same kind were noted by Cuatrecasas (1967, p. 8) during his recent investigations. My collections of Baccharis glutinosa Pers., Jackson & Saltveit 1012 from Zunil, Guatemala showed an admixture of floral types on the staminate heads. The filiform pistillate flowers appeared to be vestigial as they were small and possessed inane achenes. The disk flowers possessed typically functional anthers and abortive, reduced achenes. Archibaccharis contains herbs, shrubs and vines and to a large degree is functionally dioecious. The pistillate heads are heterogamous in all species but one. In this respect they resemble those of Conyza. The outer filiform pistillate

corollas bear achenes with 2-5(-7) nerves. The central disk flowers are small in number, 1-15(-26), and are usually without functional anthers and achenes. Exceptions are known and will be taken up later in this discussion. These distinctions of the pistillate heads, i.e., presence of disk flowers and number of achene nerves are rather constant features in the genus and are recognized in this study as being well-defined differences between Baccharis and Archibaccharis. The staminate heads of Archibaccharis are often homogamous and identical to those of Baccharis but may be consistently or sporadically heterogamous, the loss of parts and function perhaps being variable in different populations.

The fact that Baccharis and Conyza are morphologically very similar and that certain species which were discovered seemed to be confusingly intermediate between those two genera was recognized by several investigators. Bentham (1841, p. 86), in his description of B. asperifolia noted that the female specimens called Conyza to mind. Hemsley (1881, p. 129) made a similar comment referring to his B. hieraciifolia. Heering (1904, p. 39) based his genus Archibaccharis primarily on constant subdioecious conditions he found in the heads of the species known to him as did Blake (1924, p. 544) when he proposed the genus Hemibaccharis.

Other than differences in the floral composition of the heads, the genus Archibaccharis generally has thinner leaves and its members appear to be less coarse than plants of Baccharis. For example, the phyllaries in Baccharis are usually thicker and coarser than those of Archibaccharis. The triplinerved character so frequently seen in the leaves of the species of Baccharis is seldom weakly suggested as in A. flexilis or sometimes in A. Schiedeana.

As mentioned previously, Archibaccharis has exploited the scandent habit in several taxa. Sympodial stems are very pronounced in Section Hirtella (subscandent shrubs and scandent vines). This character is perhaps being utilized in a unique way by these taxa and is worth special consideration. The sharply fractiflex stems of taxa such as A. hirtella var. albescens and A. Schiedeana appear to be a specialization for support in climbing. The sharp angles formed by the main stems and branches at the nodes (and on branches and branchlets) provide "hooks" which easily become interlocked on parts of adjacent plants. The plant is thus able to climb. Considerable effort is required to completely dislodge an Archibaccharis vine which is so entangled by several multi-directional series of these secured hooking devices. The main stems of A. flexilis differ in that they climb with a twining pattern but the branchlets are noticeably fractiflex and probably aid in obtaining a purchase for climbing. As far as is known to the author, this fractiflex adaptation for climbing is unknown in the genus Baccharis.

Because the habits of both Conyza and Baccharis are

represented in Archibaccharis, that character seemed like a natural point of separation within the genus. Two sections have thus been created. The erect herbs and shrubs have been placed in the Section Archibaccharis and the subscandent and scandent taxa have been placed in the Section Hirtella.

Conyza, Archibaccharis and Baccharis share portions of their ranges. Conyza is a cosmopolitan genus known from both high and low elevations. Baccharis, the largest genus, is found in portions of North America and throughout Central and South America, also occurring at high and low elevations. Archibaccharis is known only from northern Mexico to central Panama. It has been the author's observation that Archibaccharis appears to be found only on relatively recent volcanic soils at high elevations. Some of the author's collections of Archibaccharis point out the affinity for volcanic soils. A. hirtella var. taeniotricha and A. Schiedeana were collected on the upper slopes of mildly active Volcán Pacaya in Guatemala where they were found to be covered with volcanic ash. A. hirtella var. taeniotricha was collected on the edge of the crater of the inactive Volcán San Salvador in El Salvador. These plants were not in flower and were not distributed with my other collections. This information suggests that, as a group, Archibaccharis may differ markedly from either Conyza or Baccharis in its physiological characteristics and perhaps also in its evolutionary potential. In general, Archibaccharis seems to prefer shady, moist conditions. Often the plants are found beside streams or in dense shade. There are exceptions and some species show a broader range of habitat tolerance than others.

Results of the present study provide new evidence that Archibaccharis has perhaps evolved from a herbaceous, probably erect, gynomonoecious ancestor. Morphologically, the genus Conyza provides the nearest ancestral group. Cronquist (1963), while discussing the difficulties of a strict application of the monophyletic requirement, referred to the three genera also under discussion here as examples of evolutionary parallelism. To quote, "although I would not yet want to firmly be committed to this next statement, I suspect that the common ancestor to all species of Baccharis would be Archibaccharis, the common ancestor to all species of Archibaccharis would be a Conyza and the common ancestor to all species of Conyza would be an Erigeron." A very similar statement was repeated in later discussion of the topic (Cronquist, 1968, p. 14). That is, gynomonoecious Conyza-like plants which are now extinct served as the evolutionary progenitors of the dioecious sexual system as now represented in the genus Baccharis. The characteristics of the heads found in the extant Archibaccharis taxa reflects the major evolutionary experiments one can easily imagine occurring in the evolution of a dioecious system. Vestigial rudiments of organs and function loss persist through the genus, furnishing

evidence for suspected monoecious ancestry. The following examples were found:

1) Archibaccharis corymbosa, A. linearilobis and A. subsessilis uniformly have heterogamous heads on both pistillate and staminate plants. The outer filiform corollas have well-developed ligules in the three species. Of real significance is the pattern of evolutionary change shown by the numerical reduction of ray or disk flowers and loss of function in various floral organs of the heads, suggesting evolution to functional dioecism. The outer, more numerous filiform pistillate flowers of the pistillate heads possess fertile achenes. The less numerous central disk flowers have achenes which are abortive, being completely reduced to small knobs or are inane. The anthers of these flowers are non-functional. The outer, less numerous filiform pistillate flowers of the staminate heads have achenes that are perhaps fertile but more often are inane. The more numerous central disk flowers have functional anthers but the achenes are abortive and reduced to small knobs. Thus, in function the dioecious condition is nearly achieved but the heads of both pistillate and staminate plants strongly reflect monoecious ancestry by the presence of heterogamous heads and rudimentary organs which may occasionally function.

2) The central disk flowers on the pistillate heads of Archibaccharis asperifolia, A. caloneura, A. hieraciifolia var. hieracioides, A. serratifolia, A. sescenticeps and A. Standleyi var. aequivenia bear achenes which are apparently sometimes fertile. The anthers of these flowers were found to sometimes be functional or partially so in A. hieraciifolia var. hieraciifolia and A. flexilis.

3) The sporadic occurrence of filiform pistillate flowers on the margins of the staminate heads is known (usually in small numbers) for the following taxa: Archibaccharis asperifolia, A. flexilis, A. hieraciifolia var. glandulosa, A. hieraciifolia var. hieraciifolia, A. hieraciifolia var. hieracioides, A. irazuensis, A. Schiedeana, A. simplex, A. Standleyi var. aequivenia and A. Standleyi var. Standleyi. The achenes of these flowers are apparently sometimes fertile.

4) Archibaccharis androgyna, as represented by all herbarium specimens and as indicated by my investigation of a Mexican population, appears to be functioning in a monoecious fashion with only heterogamous heads as in Conyza but in this case some evolutionary loss is shown in the floral organs. The outer filiform pistillate flowers bear fertile achenes and the central disk flowers have functional anthers and abortive achenes which are reduced and inane. Abnormal intermediate flowers were also found on some heads. This species then presents a condition very close to the ancestral one, at least as the species is now known.

5) Archibaccharis peninsularis, a species which was known

to Blake (1943) by only a single staminate specimen, presents a somewhat different condition. All of the pistillate specimens examined by the author (several recent collections) bear homogamous heads which are provided with flowers of an intermediate type. Although these pistillate flowers are unusual, they seem to be normal for this species. The 2-3(-5) nerved achenes are fertile but the corollas are tubular with five distinct and nearly evenly reduced lobes. Vestigial anthers remained in the tubes. These pistillate heads provide a curious comparison with those of the other taxa in the genus. It is as though in this species a reduced disk flower was selected to serve as the pistillate element. The filiform pistillate flowers throughout the genus are clearly zygomorphic forms. Retention of these aberrant pistillate flowers with concurrent loss of all ray flowers from an ancestral heterogamous head may represent yet a different evolutionary experiment to achieve dioecism. The disk flowers of the staminate heads bear achenes which are apparently sometimes fertile. The anthers are fully functional and the lobes are of normal size. Only disk flowers were found on the staminate heads. Because of the general habit of the species, the number of achene nerves and the pattern of evolutionary loss shown in the heads, it was concluded that A. peninsularis should be retained in the genus Archibaccharis.

6) Although it is perhaps of no direct significance to the evolution of the genus Archibaccharis, abnormal intermediate flowers were found on the pistillate heads of the following erect taxa: A. asperifolia, A. caloneura, A. hieraciifolia var. hieracioides, A. panamensis, A. serratifolia, A. sescenticeps and A. simplex. The abnormal flowers of these taxa exhibited complexes of characteristics which gave them an appearance "intermediate" between that of normal ray and disk flowers. The lobes were variously fused and reduced, usually with some form of zygomorphy. The number of corolla lobes varied as did the degree of fusion. Varying numbers of vestigial anthers were often found within the corolla tubes. That they were sometimes partially functional was evidenced by the presence of pollen grains in at least a portion of the anther sacs. The style branches were often mixed as to type, one as in the ray flowers and the other as in the disk flowers. The achenes were apparently sometimes fertile. Sketches of these abnormal intermediate flowers have been included with those of the normal flowers of a taxon. In this study these abnormal flowers have been interpreted as representing the products of irregular development sequences. Several examples of abnormal intermediate flowers have been reported in the genus Baccharis (Cuatrecasas, 1967, p. 8).

The most primitive extant species of Archibaccharis would be suspected to be a rather small, erect, herbaceous plant and perhaps bearing eglandular pubescence. A. simplex from

the highlands of Puebla and Vera Cruz, Mexico is such a plant. The highlands of central Mexico may be the center of dispersal for the genus and its evolution may well be related to past tectonic events throughout its range.

If the morphologic evidence provided by this study is accepted as reasonable to support the hypothesis that Conyza, Archibaccharis and Baccharis have indeed developed through parallel evolution and if our classification system is to attempt a real reflection of evolution, the retention of the genus Archibaccharis is perhaps justified. A case could easily be made for inclusion of this genus as a section of the genus Baccharis. The three genera could be united if one believed that differing reproductive mechanisms furnish little reason for separating otherwise similar groups. As pointed out elsewhere in this study, the three genera do not appear to differ in basic chromosome number or in pollen characters as viewed with the light microscope. The genus Archibaccharis should perhaps be regarded as a step in the evolution of Baccharis to achieve the dioecious condition.

Species Concept

Morphologically, the species and varieties of the genus Archibaccharis are quite distinct. The categories have been established on that basis and the morphological comparisons are supported with the geographic distribution patterns.

No data have been accumulated on biological species limits which may only be assumed at present. Chromosome number proved to be of little value in establishing categories as all reports indicate identical haploid and diploid numbers.

The level of variety in this study has been applied in two senses which were summarized by Davis and Heywood (1963, p. 100). The term may designate consistent morphological variants of species which occupy a rather restricted geographical area or it may be applied to variations in taxa whose "precise nature is not understood" such as my use in the establishment of three varieties of Archibaccharis hieraciifolia. The latter use of the level of variety does not exclude the conditions of incipient species or the transfer of germ plasm between taxa. Information of this nature is not available for the genus Archibaccharis.

Although minor vegetative variations were described, they were not recognized with formal or informal categories.

Cytology

Procedures and materials. In the field the buds were fixed in a solution of four parts chloroform, three parts absolute alcohol and one part glacial acetic acid. This

solution is a modified Carnoy's Solution used in the taxonomic laboratory at the University of Minnesota. The material was transported to the University of Minnesota Herbarium in screw-cap vials. Fruiting material was also collected.

PMC's were liberated from the small anther sacs by first soaking them in acetocarmine for 15-30 seconds. Maceration was accomplished by drawing off the stain with filter paper and then soaking the anthers in 10% HCL for two and one-half minutes at room temperature. After the HCL was drawn off, the anthers were crushed in a drop of stain. The cover slip was carefully lifted and one drop of water-soluble Hoyer's Medium was added. The cover slip was replaced and if additional spreading was required, pressure was applied to the surface of the cover slip with a dissecting needle. The slide was allowed to dry on a warming plate at about 26° C. The technique described above was slightly modified from a method described by Beeks (1955).

To obtain chromosome counts of Archibaccharis Pringlei and A. Schiedeana, it was necessary to germinate seeds to obtain meristematic root cells. The seeds germinated well in petri dishes without special treatment. Root tips were harvested at mid-afternoon and received cold pretreatment for twelve hours at ca. 6° C. They were changed to .002 oxyquinoline solution for four hours at about 52° C. The fixative used was the same modified Carnoy's Solution (4 : 3 : 1) referred to in the discussion of field fixation. The period of fixation was 1-2 hours at room temperature. The tips were then passed to Warmke's Solution for 12-15 minutes and received three water rinses in the vial. 1N HCL was applied at 60° C in a pre-heated oven for ten minutes and then rinsed in water (Darlington and LaCour, 1962). Maceration was accomplished by razor blade in a drop of acetocarmine. The squash and mounting in Hoyer's Medium was essentially the same as the technique described by the author for the preparation of the meiotic material. All mounts prepared in Hoyer's Medium are very satisfactory and have cleared as they have aged.

Discussion. A major collection and survey of chromosome numbers in the Tribe Astereae by several investigators has recently been in progress (Solbrig, et al., 1960, 1964, 1969). The modal number for the tribe is held to be $x = 9$ by these investigators at both the generic and the species level.

The first chromosome numbers for the genus Archibaccharis were reported as $n = 9$ (Solbrig, et al., 1969, p. 349). The widely distributed A. asperifolia and A. Schiedeana were the first taxa reported. The author's chromosome reports (Jackson, 1969) confirmed the counts of these two species and in addition established the first reported counts for thirteen other taxa of the genus. All taxa reported have a haploid number of $n = 9$ and the somatic counts of A. Pringlei and A. Schiedeana were reported as $2n = 18$.

The author would like to take this opportunity to record name changes in the original chromosome report (Jackson, 1969, pp. 435-436). The classification employed at that time was as understood according to Blake. Subsequent revision requires that the following changes be reported:

1) Jackson 1017, Archibaccharis hieracioides Blake to A. hieraciifolia Heer. var. hieracioides (Blake) J. D. Jackson.

2) Jackson 1025, Archibaccharis hirtella (DC.) Heer. var. intermedia Blake to A. hirtella (DC.) Heer. var. albescens J. D. Jackson.

3) Jackson 1030, Archibaccharis oaxacana (Greenm.) Blake to A. hieraciifolia Heer. var. hieraciifolia.

4) Jackson 1037, Archibaccharis serratifolia (H.B.K.) var. paniculata (J. D. Sm.) Blake to A. serratifolia (H.B.K.) Blake.

5) Jackson 1041, Archibaccharis torquis Blake to A. Schiedeana (Benth.) J. D. Jackson.

6) Jackson 1044, Archibaccharis prorepens Blake to Baccharis prorepens (Blake) J. D. Jackson.

Although no instances of polyploid chromosome counts have been reported for Archibaccharis, representatives of two collections studied are suspected of being polyploid individuals. Breedlove 8515 (MICH) is quite similar to the other known specimens of A. linearilobis except for very thick leaves, larger epidermal trichomes and extremely large heads and flowers. Camp 2680 (NY) shows the characters of A. hieraciifolia var. hieraciifolia but is similarly a giant form. The unusually large heads and flowers bear extremely large trichomes as do the stems.

Camera lucida drawings of the chromosome figures are shown in figures 1 and 2. Although the chromosome count of A. flexilis was reported (Jackson, 1969, p. 435) the nature of the preparation was such that a good camera lucida drawing was not possible. The few meiotic cells in the anther sacs of the central disk flowers of the pistillate heads did not provide good subject material.

Pollen

Pollen grains were mounted in 85% lactic acid during the month of July, 1969, to produce an expanded configuration for study. The length of the polar and equatorial axes were measured. Twenty-five measurements of each axis were completed on samples from each taxon. Five additional grains were measured from a different geographical location to provide verification. In some cases, only one sample was available for a particular taxon. The range of measurements obtained from the grains of each taxon are shown in Table 1.

Fig. 1. Camera lucida drawings of chromosomes of Archibaccharis taxa, all approximately X2200: (a) A. asperifolia, anaphase II (Jackson 1027); (b) A. sescenticeps, diakinesis (Jackson 1047); (c) A. subsessilis, metaphase II (Jackson 1033); (d) A. corymbosa, metaphase I (Jackson 1043); (e) A. serratifolia, anaphase I (Jackson 1048); (f) A. androgyna, metaphase I (Jackson 1034); (g) A. hieraciifolia var. hieracioides, metaphase I (Jackson 1017); (h) A. hieraciifolia var. hieraciifolia, anaphase I (Jackson 1030).

Fig. 2. Camera lucida drawings of chromosomes of Archibaccharis taxa, all approximately X2200. (a) A. hirtella var. albescens, mitotic division of haploid microspore (Jackson 1025); (b) A. hirtella var. hirtella, anaphase I (Jackson 1046); (c) A. hirtella var. taeniotricha, metaphase I (Jackson 1042); (d) A. Schiedeana, mitotic metaphase of root cell (Jackson 1041); (e) A. Blakeana, metaphase I (Jackson 1036); (f) A. Pringlei, mitotic metaphase of root cell (Jackson 1031).

Table 1. Measurements of Polar and Equatorial Axes *Archibaccharis* Pollen Grains (Microns)

Taxon	Polar axis	Equatorial axis
A. simplex	20.5-24.4	22.7-27.2
A. campii	19.4-24.4	23.3-27.8
A. hieraciifolia var. *glandulosa*	23.3-27.8	23.9-30.0
A. hieraciifolia var. *hieracioides*	21.2-28.9	25.5-30.0
A. hieraciifolia var. *hieraciifolia*	23.3-28.3	25.5-31.0
A. corymbosa	13.3-23.3	16.7-25.5
A. Standleyi var. *Standleyi*	all preparations exhibited deformed pollen	
A. Standleyi var. *aequivenia*	21.0-23.3	22.2-24.4
A. subsessilis	16.7-19.0	19.0-23.3
A. linearilobis	22.2-28.9	24.4-32.1
A. sescenticeps	17.8-23.3	18.9-25.0
A. serratifolia	16.0-19.4	16.7-21.0
A. peninsularis	16.0-20.0	17.8-22.8
A. asperifolia	14.4-20.0	16.7-22.2
A. androgyna	16.7-22.0	17.8-24.4
A. caloneura	22.2-24.4	24.6-28.9
A. irazuensis	16.7-21.0	18.9-23.3
A. panamensis	staminate plant unknown	

Table 1. Measurements of Polar and Equatorial Axes
Archibaccharis Pollen Grains (Microns)
(Continued from preceding page)

Taxon	Polar axis	Equatorial axis
A. Pringlei	16.7-18.9	18.9-21.0
A. Blakeana	16.7-20.5	18.9-23.3
A. hirtella var. albescens	15.0-20.0	16.7-21.0
A. hirtella var. hirtella	13.9-17.8	15.5-18.9
A. hirtella var. intermedia	16.7-19.4	18.9-21.0
A. hirtella var. taeniotricha	16.7-21.0	17.8-22.2
A. salmeoides	17.5-21.0	19.5-23.0
A. lucentifolia	25.5-32.1	28.9-35.5
A. flexilis	18.3-23.3	18.9-24.4
A. Schiedeana	15.5-18.9	17.8-21.2

The taxa in Table 1 have been grouped according to those believed to possess close genetic relationships. The grain sizes might prove to be statistically separable if one wished to perform the appropriate statistical tests. In nearly all cases, the taxa are readily separable utilizing vegetative and floral morphology.

Archibaccharis pollen grains are oblate spheroidal, amb type is angulaperturate (circular open); polar axis 13.3-32.1 microns, equatorial axis 15.5-35.6 microns, grain size from small to medium (Erdtman, 1952); tricolporate, rarely with four colpi, membrane smooth, colpi and pore margins smooth; exine echinate, tectate, finely scabrate (granular) with a few larger projections sometimes located irregularly between the spines, scabrations appearing larger on the spine bases; yellow perine sometimes present.

The general characteristics of Archibaccharis pollen grains do not seem perceptibly different from those of Conyza or

Baccharis when studied with the light microscope. Wodehouse (1935, p. 490) found few differences in "emphytic" characters of the pollen grains throughout the entire Tribe Astereae and further stated that this was in line with the close relationship believed to exist between all the species in the tribe. "The interrelationships of these species are so close that their differences do not come to visible expression."

Taxonomic Characters

The discussions and descriptions of taxonomic characters in this study are as they are known within the limits of the author's experience.

Habit: The species of Archibaccharis are herbs, erect shrubs, subscandent shrubs or vines. The genus has been divided into two sections on the basis of habit, separating the erect taxa from those which are subscandent or scandent.

Subterranean Parts: All of the taxa collected by the author appeared to possess perennial underground parts. These were either fibrous root systems or rhizomatous.

Stems: The vascular cambia of all of the members of the genus are quite active and develop a considerable amount of secondary wood during one growing season. Tall species such as Archibaccharis corymbosa and A. asperifolia possess quite woody stems with large pith areas but by appearance pass very well for shrubs. Other than this no evidence was found to support observations on collector's labels which described the habit of these two species as "shrubs." Cross-sections of stems indicated only one season's cambial activity. These plants seem to be large herbs which resemble shrubs. In contrast, the stems of A. subsessilis and A. sescenticeps show continuous secondary thickening, persisting for several seasons. The sharply fractiflex (zig-zag) stems of many of the subscandent and scandent taxa provide an excellent diagnostic feature. Archibaccharis stems are generally striate but the angled or terete character is distinctive. The long internode is a useful mark for A. Pringlei and A. Blakeana. Stem color is variable for most of the taxa but often one color predominates. The stems of A. asperifolia are usually reddish-purple but green stems are known. The brown stems of A. flexilis are very distinct.

Leaves: Both sessile and petioled leaf conditions are found in the genus. The length of the petiole can be a very useful character when contrasting two species such as Archibaccharis corymbosa and A. subsessilis, commonly confused because of similar head and floral characteristics. Taxa which consistently have sessile leaves also possess auriculate leaf bases.

The leaf shapes are generally distinctive for the taxa. The bases and apices of the leaves also provide valuable

features.

The leaf texture is distinctive for some taxa although this character may vary within a taxon. The leaves of *Archibaccharis lucentifolia* and *A. salmeoides* are always thick and shiny when compared with most other taxa.

The density of leaf pubescence may vary in one taxon or it may be quite consistent. The subglabrous condition is shown by *Archibaccharis androgyna* and *A. caloneura* while in *A. Schiedeana* the leaves may rarely be subglabrous but are usually pubescent on both surfaces. For most of the taxa in the genus, the pubescence on the midribs and the major lateral veins (above and below) is noticeably thicker than on the adjacent surfaces.

Pubescence: This characer is quite distinctive for most of the taxa. A variety of indumentum types is found throughout the genus, including glandular hairs. The hairs are usually small and the diminutive form of the descriptive terms describing them has often been applied. The indumentum types have been classified following the descriptions of Lawrence (1955). The density of pubescence may vary from specimen to specimen within one taxon. The density and harshness of the pubescence on stems and leaves were found to vary greatly in single populations of *Archibaccharis serratifolia*. These characters formerly were the basis for two varieties of that species.

Phyllaries: The phyllary shape is sometimes distinctive as in *Archibaccharis salmeoides* which has ovate phyllaries. In the descriptions, only the phyllaries of the pistillate heads were detailed. Most features of those of the staminate heads are identical in the same taxon except that they are somewhat broader and shorter.

The phyllaries may bear pubescence which is diagnostic. They may be puberulous as in *Archibaccharis subsessilis*, glandular as in the *A. hieraciifolia* complex or glabrous as in *A. caloneura*.

The shape of the phyllary apex may be consistent within one taxon or sometimes it is variable. As an example, those of *Archibaccharis hieraciifolia* var. *hieracioides* are always long-acuminate whereas in *A. linearilobis* they may be acute or acuminate.

Pappus: The pappus color is often distinct for a taxon. The bristles of *Archibaccharis corymbosa* are always pink or red and in *A. Schiedeana* the pappus is brown-tinged.

Corollas: The corolla color is often characteristic of a taxon or a cluster of taxa. The members of the *Archibaccharis hirtella* complex always have purple flowers at maturity. *A. corymbosa*, at least in nearly all known collections, consistently has pink flowers which become purple at maturity. More than one corolla color may be shown by one taxon as in *A. asperifolia* where the flowers may be white or creamy-white. Some taxa present bi-colored corollas. *A. salmeoides* and

A. lucentifolia have filiform and disk corollas which are white below but purple or pink above.

Most members of the genus possess puberulous hairs on their corollas. The amount and placement of the hairs on the tubes and throats may be a diagnostic aid. The hairs are nearly erect or antrorse and often clavellate or subclavellate. The lobes of the disk corollas may have hairs on the inside and/or outside surfaces in some taxa while these are lacking in others. The ligules of the filiform corollas appear always to be glabrous.

Throughout the genus the ligules of the filiform corollas show various degrees of reduction. The ligules on these flowers of Archibaccharis corymbosa, A. subsessilis and A. linearilobis are always well-developed on both staminate and pistillate heads. The heads have a very distinctive appearance due to the presence of these long ligules. The ligules were measured from the base of the ligular sinuses to the apex.

The lobes of the disk corollas are usually of a constant shape for a taxon although a closely related group of taxa may exhibit similar shapes. The number of lobes per corolla is normally five but abnormal numbers up to ten have been observed.

Style Branches: The style branches of the filiform flowers show no differences which could be considered of great diagnostic value when those of any of the taxa are compared. The style branches of the disk flowers have various shapes which are valuable as taxonomic characters. The Archibaccharis hirtella complex usually shows rhombic-oblong style branches while those of A. Schiedeana and closely related species possess linear or less often, oblong shapes.

Achenes: Some of the achene characters are diagnostic for certain taxa. The compressed, oblong, elliptical or ovate shapes appear nearly universally throughout the genus. The color is uniformly whitish during immaturity to brown at maturity. The texture may vary from dull to very shiny and is distinctive for some of the taxa. The achene pubescence is nearly always hispidulous but in a few taxa such as Archibaccharis peninsularis the hairs appear softer and have been termed hirtellous. In A. subsessilis, superficial glands are found on the surfaces of the achenes mixed with hispidulous hairs. The number of nerves per achene is fairly constant throughout the genus but some variation is shown. In the descriptions, only the number of nerves found on the fertile and inane achenes of the filiform flowers were recorded. In general, the achene detail in the descriptions was drawn from these flowers found in the pistillate heads where it is most clear.

Terminology

Because of the complexities of the heads and floral organs of Archibaccharis, the following special terms employed are defined.

Abnormal intermediate flower: a flower appearing abnormal in that it bears a mixture of characters, some of which are usually associated with filiform ray flowers and some with disk flowers.

Abortive: in general, achenes that are defective, barren or imperfectly developed; inane achenes and those reduced to small knobs or stipitiform shapes are termed abortive.

Dioecious: sexes separated by virtue of being on different plants (in Baccharis, also in two different flower forms).

Fertile: achenes that are full and completely formed.

Gynomonoecious: when fully functional hermaphrodite and female flowers are borne on the same plant (in Conyza, also on the same heads).

Heterogamous: composite heads bearing both filiform ray and disk flowers, the ligules of the ray flowers sometimes much reduced.

Homogamous: composite heads bearing only one of the two types of flowers, i.e., either composed wholly of ray flowers or wholly of disk flowers.

Inane: an achene which is fully formed or nearly so but is empty; regarded as an abortive type.

Ligule: the spreading limb of the marginally located zygomorphic ray flowers of composite heads. Flowers which exhibited very little ligule development but were clearly zygomorphic have been treated as "reduced" ligulate (ray) flowers; often referred to as "filiform ray flowers."

Sterile: floral sex organs which are non-functional, producing no sexual products.

Systematic Treatment

ARCHIBACCHARIS Heering.

Archibaccharis Heering, Jahr. Hamb. Wissensch. Anst. 21, Beiheft 3: 40. 1904.

Hemibaccharis Blake, Contr. U. S. Nat. Herb. 20: 544-545. 1924.

Perennial, ligneous, erect, rarely spreading herbs, shrubs or subscandent shrubs and scandent vines; ca. 1.5-100 dm tall; above-ground parts usually pubescent, the trichomes of various types. Rhizomes present or absent. As a genus, nearly totally dioecious but the heads often displaying a diminished gynomonoecious condition, either sporadically or consistently. Stems essentially with ascending, rarely lax branches and branchlets at least above, these often axillary bearing immature leaves and inflorescences as well, straight to sharply fractiflex or twining, terete or angled, the bases 0.3-20.0 mm

in diam., graduating to ca. 1.0 mm near the inflorescences, usually striate, variously colored, usually pubescent at least above, rarely glabrous. Leaves alternate, sessile or with petioles 1.0-35.0 mm long; blades variously shaped, membranaceous to coriaceous but usually chartaceous, cordate, subcordate, attenuate, cuneate or auriculate-amplexicaul at bases, acute or acuminate and sometimes falcate as well at apices, margins serrate, serrulate or merely denticulate distally, the teeth mucronate or mucronulate, rarely completely entire, the upper surfaces dark-green, dull or shiny, the midribs and major lateral veins impressed or slightly prominent, the lower surfaces lighter green or darker like the the upper surfaces, dull or shiny, the midribs prominent, the lateral veins slightly prominent. Inflorescences of terminal and axillary panicles which may be cymose or corymbiform, the slender branchlets and peduncles subtended by small subulate or linear bracts, the lowest of which are foliaceous. Heads hemispherical, discoid or disciform due to reduced ligules or distinctly radiate, receptacles nearly flat, alveolate, involucres 3-6 seriate, graduate; phyllaries subulate, triangular, ovate or lanceolate to linear, not coarse, usually somewhat broader and shorter on the staminate heads but otherwise similar to those of the pistillate heads, margins usually narrow and scarious, short or long-ciliolate above and sometimes lacerate as well, nearly white, green-white or purple, centers 1-nerved, green, purple or red, obtuse, acute or acuminate at apices; flowers variously colored, bicolored in some taxa, the corollas puberulous, these hairs often clavellate or subclavellate and nearly erect or antrorse, rarely hirtellous, pappus 1-seriate, barbellate, often contorted at bases, rarely irregular, the apices usually dilated on the disk flowers and sometimes slightly so on the pistillate flowers, variously colored, achenes compressed, ovate, oblong or elliptical when fertile, sometimes inane, stipitiform or nearly totally reduced to small knobs, 2-5(-7) nerved, mostly trigonous, shiny to dull, hispidulous or rarely hirtellous. <u>Pistillate heads</u>: 3.5-15.0 mm high, nearly always heterogamous; the outer flowers filiform, 9-127, the usually erect ligules well-developed or reduced, glabrous, the style branches linear or sublinear, flat with acute or obtuse apices and usually finely pubescent margins, achenes fertile; central disk flowers 1-15(-26), anthers usually sterile, rarely functional, style branches variously shaped, hispidulous, achenes usually abortive, inane or greatly reduced to stipitiform or small knobby forms, rarely fertile; abnormal intermediate flowers sometimes present; in one exceptional species the heads are uniformly composed of tubular intermediate appearing flowers bearing vestigial anthers. <u>Staminate heads</u>: 3.0-10.0 mm high, usually homogamous but always heterogamous in three species and sporadically so in many species; the outer flowers, when present, filiform, 1-23(-29), similar to those of the

pistillate heads but often reduced, achenes apparently fertile but sometimes inane; disk flowers 5-93, anthers functional, style branches variously shaped and hispidulous, achenes usually completely abortive and reduced to small knobs but sometimes inane, rarely fertile; abnormal intermediate flowers rarely present. Heads of the monoecious species: 3.4-5.0 mm high, heterogamous, the achenes of the outer filiform flowers fertile, the anthers of the central disk flowers functional but the achenes abortive, greatly reduced to knobby or inane forms. Recorded chromosome numbers of the genus: n = 9, 2n = 18.

Type species: *Archibaccharis hieraciifolia* Heering.

Key to Sections of the Genus *Archibaccharis*

A. Erect herbs and shrubs, the main stems essentially straight or obscurely fractiflex . . . Section I. *Archibaccharis*.

AA. Subscandent shrubs or scandent vines, the main stems noticeably fractiflex or twining . . . . Section II. *Hirtella*.

Section I. *Archibaccharis*.

Herbae et frutices erecti.

Erect herbs and shrubs, the stems essentially straight or obscurely fractiflex.

Taxa in this section occur from northern Mexico including Baja California Sur to central Panama.

Type species: *Archibaccharis hieraciifolia* Heering.

Key to the taxa in Section *Archibaccharis*

A. Stems glandular-pubescent above or at least with some glandular hairs on the branchlets and peduncles; leaves sessile or with petioles and cuneate leaf bases

B. Leaves with definite petioles, even though sometimes short

C. Petioles short, 1.0-2.0 mm long; leaf pubescence eglandular on the upper and lower surfaces; Oaxaca, Mexico . . . . 2. *A. campii*

CC. Petioles usually longer, 2.0-20.0 mm long; leaves glandular-pubescent on the upper and lower surfaces; central Mexico . . . . 3a. *A. hieraciifolia* var. *hieracioides* (see BB, also sometimes with sessile leaves)

BB. Leaves sessile, the bases auriculate-amplexicaul

D. Apices of mature cauline leaves chiefly acute

E. Leaf blades usually contracted abruptly but sometimes gradually below the middle to form linear or tapered petioliform portions 2.0-9.0 mm wide, these usually narrower than the widest part of the blades; filiform flowers of the pistillate heads 59-73; Oaxaca, Mexico . . . . 3. _A. hieraciifolia_ var. _hieraciifolia_

EE. Leaf blades usually narrowing slightly toward the bases appearing nearly linear throughout or with some of the leaves narrowing more abruptly just below the middle forming nearly linear petioliform portions 3.0-12.0 mm wide, these much narrower than the widest part of the blades; filiform flowers of the pistillate heads 100-127; Guerrero, Mexico and Puebla, Mexico . . . . 3b. _A. hieraciifolia_ var. _glandulosa_

DD. Apices of mature cauline leaves chiefly acuminate . . . . . 3a. _A. hieraciifolia_ var. _hieracioides_ (see CC, leaves also sometimes with petioles)

AA. Stems pubescent with eglandular hairs, subglabrous or glabrous above or if glandular-pubescent, the petioles short, (1.0-3.5(-4.0) mm long and the leaf bases shallowly cordate; mature leaves always with definite petioles

F. Stems thickly puberulous, glandular-pubescent, uniformly villosulous or essentially glabrous above except for tomentulose hairs sometimes present on branches, branchlets and peduncles and/or the filiform flowers consistently present on both pistillate and staminate heads, the ligules of these corollas well-developed, exceeding 1.2 mm

G. Ligules of the filiform corollas well-developed on both pistillate and staminate heads, 1.2-2.9 mm long

H. Petioles short, 1.0-3.5(-4.0) mm long; leaf bases cordate or shallowly so, rarely rounded; corollas white, sometimes light-yellow, rarely purple; pappus bristles white or perhaps light-yellow

I. Stems thickly puberulous above; leaf surfaces hispidulous . . . . 4. _A. subsessilis_

II. Stems glandular-pubescent above; upper and lower leaf surfaces glandular-

pubescent . . . . . 5. A. linearilobis

HH. Petioles longer, (2.0-)11.0-15.0 mm long; leaf bases cuneate, less often rounded; corollas pink to purple, rarely white; pappus bristles usually bright red or pink at least near the apices, rarely light-yellow . . . . 6. A. corymbosa

GG. Ligules of the filiform corollas on the pistillate heads (also staminate heads, if sporadically present in small numbers or perhaps these flowers are lacking on the staminate heads) not as well-developed, reduced, 0.1-1.2 mm long

J. Stems thickly puberulous above; lobes of the disk flowers on the staminate heads linear (those of the pistillate heads also linear where known), 1.6-3.0 mm long

K. Leaf blades ovate or lance-ovate, 4.0-6.0 cm long; Honduras . . . . 7. A. Standleyi var. Standleyi

KK. Leaf blades lanceolate, lance-elliptic or lance-oblong, 6.0-16.0 cm long; southern Mexico and Guatemala . . . . 7a. A. Standleyi var. aequivenia

JJ. Stems essentially glabrous above except for whitish tomentulose hairs sometimes present on branches, branchlets and peduncles or with whitish arachnose-tomentulose hairs above and on branches, branchlets and peduncles; lobes of the disk flowers of the staminate heads variable, oblong, linear, triangular or merely acute, 0.7-1.5 mm long

L. Tall herbs(?); stems terete, green or purple, shiny, essentially glabrous or whitish tomentulose hairs sometimes present; leaves chiefly elliptical, rarely ovate, the upper surfaces usually scabrous . . . . 8. A. asperifolia

LL. Shrubs; stems usually angled, purple, dull, whitish arachnose-tomentulose hairs above; leaves chiefly oblong-ovate or ovate, the upper surfaces usually hispidulous, rarely glabrous . . . . 11. A. sescenticeps

FF. Stems tomentose, tomentulose, hispidulous, pilosulous-villosulous or pilosulous above but if stems are subglabrous or glabrous above, the leaves are also subglabrous or glabrous on both surfaces; filiform

flowers only sporadically present in small numbers (if at all) on the staminate heads, the ligules of these corollas on both pistillate and staminate heads (unless not known) always short or essentially wanting, less than 0.8 mm long

M. Stems distinctly pubescent above, usually for some distance below the inflorescences, the hairs sometimes minute

N. Erect shrubs; stems thickly or sparsely tomentose or tomentulose above, the hairs sometimes shorter and harsher; hairs canescent, cinereous or sordid in color . . . . 12. _A. serratifolia_

NN. Herbs and low spreading shrubs; stems pilosulous-villosulous, sparsely or densely pilosulous or hispidulous

O. Stems hispidulous above, sometimes with sparse pilosulous hairs

P. Low spreading shrubs; stems white-hispidulous; upper and lower surfaces somewhat shiny, usually covered with white hirtellous and hispidulous hairs; pistillate heads homogamous with intermediate 5-lobed corollas; corollas on pistillate and staminate heads white becoming purple or rosy at maturity; Baja California Sur, Mexico . . . . 13. _A. peninsularis_

PP. Herbs; stems hispidulous or sometimes with sparse pilosulous hairs, these usually sordid and the stiffer ones incurved; upper leaf surfaces somewhat dull, glabrous or with scattered pilosulous hairs near the margins and apices; pistillate heads heterogamous, the corollas white; achenes glabrous; Puebla and Vera Cruz, Mexico . . . . 1. _A. simplex_

OO. Stems always with softer, sordid or brown pubescence above, pilosulous-villosulous or quite densely pilosulous

Q. Herbs; stems pilosulous-villosulous above; leaf blades elliptical-obovate or oblong-elliptical; lower leaf surfaces gray-green, dull; leaf apices short-acute or barely short-acuminate; Panama . . . . 14. _A. panamensis_

QQ. Herbs(?); stems densely pilosulous above; leaf blades lance-ovate, lance-elliptic, merely ovate or elliptic; lower leaf surfaces light-green, dull; leaf apices long-acuminate; Costa Rica and Panama . . . . 15. A. irazuensis

MM. Stems essentially glabrous or glabrescent with some hispidulous and puberulous hairs on the branchlets and peduncles; leaves shiny and subglabrous or glabrous on both the upper and lower surfaces

R. Stems glabrescent above with some hispidulous and puberulous hairs on the branchlets and peduncles; leaves mostly oblong-ovate but sometimes elliptical, pergamentaceous; pappus bristles on the disk flower of the staminate heads irregular, composed of basally connate mixed groupings of regular barbellate bristles and ligulate papillose structures . . . . 9. A. caloneura

RR. Stems essentially glabrous above as well as on the branches and peduncles; leaves narrowly lanceolate, thinly chartaceous; pappus bristles on all heads regular, barbellate . . . . 10. A. androgyna

1. ARCHIBACCHARIS SIMPLEX Blake, Journ. Washington Acad. Sci. 17: 61. 1927. Hemibaccharis simplex Blake, Contr. U. S. Nat. Herb. 20: 547-548. pl. 49. 1927. Type: MEXICO: State of Puebla: woodlands around Honey Station, no ele. cited, 25 November 1903, Pringle 11821 (US!; photo. MIN! NY! UC!; isotypes: GH! MICH! MO! MSC! TEX! UC!).

Archibaccharis Schultzii Heer., Jahr. Hamb. Wissensch. Anst. 21: Beiheft 3: 40. 1904. nom. nud.

Erect or ascending ligneous herbs; ca. 3.7-6 dm tall; the bases procumbent, rhizomatous. Stems slender, angled especially near the decurrent leaf bases, the bases ca. 2.0 mm in diam., graduating to ca. 1.5 mm above, the internodes 5.0-25.0 mm long, dull, brown below becoming purple above, glabrescent below, hispidulous or with sparse pilosulous hairs above, the hairs usually sordid and the stiffer ones incurved, often with subtuberculate bases. Leaves with short petioles, 2.0-5.0 mm long, puberulous; blades oblanceolate, elliptic, oblong-elliptic or obovate, 4.5-8.0 cm long, 1.5-2.0 cm wide, thinly chartaceous or membranaceous, cuneate at bases, acute or short-acuminate at apices; margins distally serrulate or merely denticulate, the upper surfaces dark-green, dull, glabrous or with scattered pilosulous hairs near the margins and apices, the lower surfaces

lighter green, dull, glabrous or sparsely pubescent. Panicles corymbiform, the peduncles lax and pilosulous. Pistillate Heads: 6.0-8.5 mm high, ca. 3.5 mm wide, phyllaries 4-5 seriate, the outer triangular, lanceolate and glabrous, the inner linear-lanceolate and glabrous; filiform ray flowers 34-48, pappus 4.4-5.2 mm long, whitish or brown-tinged, corollas 3.3-4.0 mm long, white, the tubes puberulous, the ligules erect, 0.2-0.3 mm long, densely puberulous with antrorse hairs which exceed the apices, achenes 0.9-1.4 mm long, 2-3 nerved, shiny and glabrous; disk flowers 1-5, pappus 4.8-5.8 mm long, corollas 4.8-5.6 mm long, white, anthers sterile, achenes abortive, inane or reduced to small knobs; abnormal intermediate flowers are sometimes present. Staminate Heads: ca. 8.0 mm high, ca. 6.0 mm wide, phyllaries ca. 5-seriate; filiform ray flowers occurring sporadically, 0-2 or perhaps more, vestigial, much smaller but similar to the filiform flowers of the pistillate heads; disk flowers ca. 32, white, pappus 4.2-4.8 mm long, whitish or brown-tinged, tubes 2.0-2.2 mm long, sparsely puberulous, limb 3.0-3.6 mm long, puberulous, lobes triangular, 1.0-1.9 mm long, dorsally puberulous, style branches linear-lanceolate, acute or barely acuminate, achenes inane.

Pollen diameters (microns): polar, 20.5-24.4; equatorial, 22.7-27.2; Pringle 11821.

Floral illustrations: Fig. 3.

Known only from the states of Puebla and Vera Cruz, Mexico, 2600-3030 m ele., (Fig. 8). Honey Station is a village situated on moist woodlands on an area of former volcanic activity. Obsidian fragments are abundant along the roadways. Current maps show Honey Station just over the border in the state of Puebla rather than in Hidalgo as recorded by Pringle. My visit to Honey Station was by automobile in mid-January, 1969. Specimens of A. simplex were not located despite a search which included all the woodlands immediately surrounding the village and a short journey along the River San Marcos. C. G. Pringle's collection was made in the month of November, a fact which may help explain the author's failure. Certainly the habitat has undergone change since 1903. The clean pine stands were at least second growth as evidenced by the neatly planted rows.

The Pringle collection of A. simplex was originally distributed as Baccharis hieracifolia Hemsl., a species now known as A. hieraciifolia Heer. var. hieracioides. The two taxa are perhaps closely related but differ particularly in leaf characters and pubescence.

The range of A. simplex may now be extended to the state of Vera Cruz. As represented in the Paris and Copenhagen Herbaria, Liebmann 425 belongs to this species. Liebmann 425 in the Gray Herbarium is A. Schiedeana. Heering (1904, p. 41) had a Liebmann 425 before him for which he suggested the name "Archibaccharis Schultzii." Heering's brief reference to "leaves sessile or short-stemmed" and bare leaf surfaces indicates he probably was studying the plant later described by Blake as A. simplex. Because the name A. Schultzii was published without description or diagnosis, it has been treated here as a nomen nudum.

During my dissection of Pringle 11821, two vestigial filiform flowers with inane achenes were found on the margins of a staminate head. These flowers were smaller than those fertile flowers of the pistillate heads but were otherwise similar.

MEXICO: State of Vera Cruz: peak of Mt. Orizaba, Liebmann 425, in part (C, fragments P).

2. ARCHIBACCHARIS CAMPII Blake, Proc. Biol. Soc. Washington 55: 115-116. 1942. Type: MEXICO: State of Oaxaca: lower slopes Mt. Zempoaltepetl, 19-27 February 1937, Camp 2700 (NY!; photo. MIN!; photo. and fragments, US!).

Erect ligneous herbs(?); ca. 6 dm tall; subterranean parts and bases not seen. Stems obscurely fractiflex above, nearly terete or round-angled, 1.2-3.0 mm in diam. above, the internodes 1.0-3.0 cm long above, barely shiny, purple or brown, the hairs weak and scattered below but becoming densely pilosulous above with some hirtellous and glandular hairs. Leaves with petioles mostly wanting, sometimes 1.0-2.0 mm long, hirtellous-pilosulous; blades elliptic-oblong or lance-oblong, 6.0-11.0 cm long, 2.0-4.0 cm wide, thickly chartaceous, cuneate at bases, usually long-acuminate at apices but sometimes more abrupt, margins serrate or simply denticulate, the upper surfaces dark-green, dull, rather densely and evenly hirtellous with some pilosulous and hispidulous hairs, the lower surfaces lighter green, dull, sparsely hirtellous with some pilosulous hairs. Panicles convex, the peduncles with many stiff, glandular hairs mixed with hirtellous and pilosulous hairs. Pistillate Heads: 7.0-8.0 mm high, 3.0-3.5 mm wide, phyllaries 5-6 seriate, acute or obtuse, the outer lance-ovate, sparsely puberulous with some short glandular hairs, the inner linear-lanceolate and similarly puberulous; filiform ray flowers ca. 38, pappus 5.2-5.8 mm long, white, corollas 3.5-5.4 mm long, white, sparsely puberulous, the hairs denser near the apices, the ligules erect if present, ca. 0.6 mm long, achenes 1.5-1.8 mm long, 2-3 nerved, somewhat shiny and hispidulous; disk flowers 2-4, pappus 4.6-5.8 mm long, corollas 5.4-5.9 mm long, white, anthers sterile, achenes abortive, inane or reduced to small knobs. Staminate Heads: 7.5 mm high, ca. 8.0 mm wide; phyllaries 5-6 seriate; disk flowers ca. 42, white, pappus 4.3-4.6 mm long, white, tubes 2.2-2.5 mm long, sparsely puberulous, limb 2.6-3.4 mm long, puberulous below, lobes oblong, 1.6-1.9 mm long, sparsely puberulous near the apices of the dorsal surfaces, style branches linear, acuminate or perhaps attenuate, achenes abortive, reduced to small knobs.

Pollen diameters (microns): polar, 19.4-24.4; equatorial, 23.3-27.8; Camp 2685.

Floral illustrations: Fig. 3.

Known only from the type locality in Mexico (Fig. 8). Mt. Zempoaltepetl is 3200 m at the top and is the highest mountain in the state of Oaxaca. Detailed information relative to the data on Camp's collection labels has been provided by Blake (1942). Camp's labels read "top, middle to upper and lower slopes" of Mt. Zempoaltepetl. "Top" indicated the last few hundred feet below

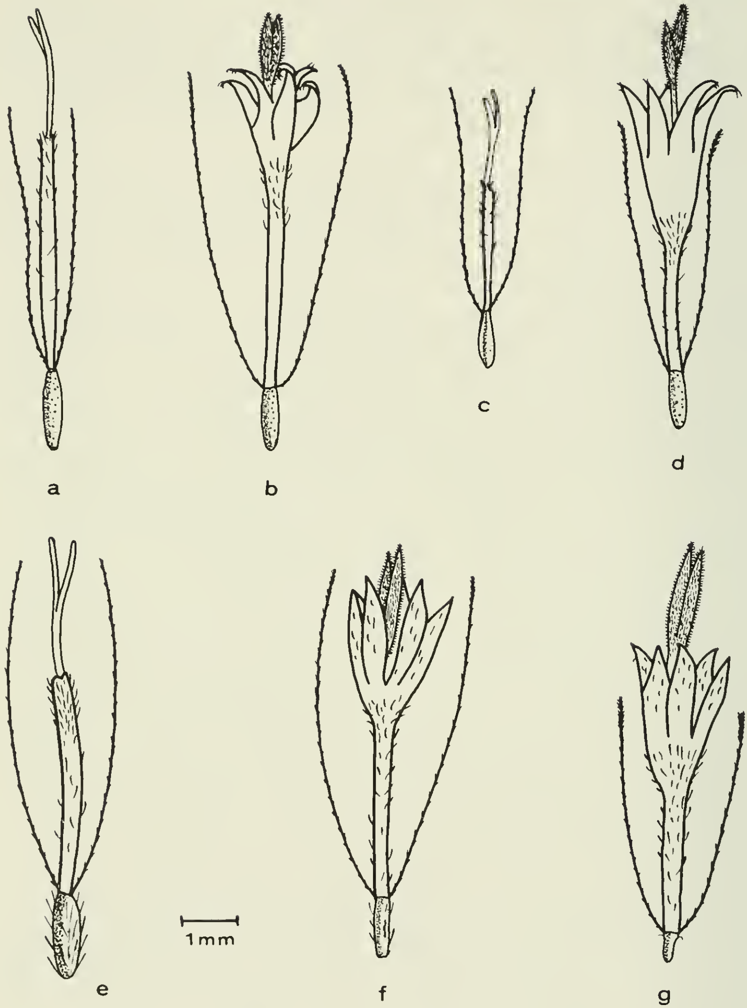

Fig. 3. Floral illustrations of Archibaccharis simplex and A. campii. A. simplex (all from Pringle 11821): (a, b) pistillate heads: (a) filiform flower, (b) disk flower; (c, d) staminate heads: (c) filiform flower, (d) disk flower. A. campii: (e, f) pistillate heads (Camp 2700): (e) filiform flower, (f) disk flower; staminate heads: (g) disk flower (Camp 2685). Disk flowers are shown without anthers.

the summit while "upper slopes" described the region 500-1000 feet below the summit and "middle" meant the region that extended several thousand feet below the upper regions. The staminate specimen of A. campii was collected on the middle slopes and the pistillate specimen on the lower slopes.

The characteristics of this inadequately known species suggest that it is closely related to A. hieraciifolia var. hieracioides. They differ in petiole length, pubescence and phyllary morphology. The plant probably has a herbaceous stem although this has yet to be verified. More material is needed for study.

MEXICO: State of Oaxaca: middle slopes, Mt. Zempoaltepetl, Camp 2685 (NY, photo., US).

3. ARCHIBACCHARIS HIERACIIFOLIA Heer. var. HIERACIIFOLIA.

Archibaccharis hieraciifolia Heer., Jahr. Hamb. Wissensch. Anst. 21: Beiheft 3: 40. 1904 (prim.). Type: MEXICO: State of Oaxaca: Sierra de San Felipe, ele. 2966 m, 13 Dec. 1895, Pringle 6257 (HBG; photo. MIN!; isotypes: BM! F! GH! K! MIN! MO! MSC! NY! P! UC! US!).

Baccharis oaxacana Greenm., Proc. Amer. Acad. 40: 37. 1904. Hemibaccharis oaxacana (Greenm.) Blake, Contr. U. S. Nat. Herb. 20: 546. 1924. Archibaccharis oaxacana (Greenm.) Blake, ibid. 23: 1508. 1926. Type: Pringle 6257.

Erect ligneous herbs; ca. 3-11 dm tall; glandular pubescent; the bases often procumbent, rhizomatous. Stems essentially straight but sometimes fractiflex, terete or angled near the decurrent bases of the petioles, the bases 2.0-5.0 mm in diam., graduating to 1.0-4.0 mm above, the internodes 0.8-6.5 cm long, dull or shiny, brown, red-brown, green or purple, glabrescent or densely whitish pilosulous below, densely glandular-pubescent above. Leaves sessile; blades narrowing abruptly or sometimes gradually towards the bases below the middle, elliptic, oblanceolate, ovate or obovate, 5.0-13.5 cm long, 2.0-4.5 cm wide, chartaceous, always auriculate-amplexicaul at bases with the obtuse auricles sometimes wider than the linear or tapered petioliform portions which are 2.0-9.0 mm wide, the older cauline leaves usually abruptly acute, subobtuse, barely acuminate or acute at apices, margins distally serrate, serrulate or merely denticulate, the upper surfaces dark-green, dull, glandular-pubescent, the lower surfaces lighter green, glandular-pubescent with the shorter, erect glandular hairs often obscured by pilosulous-villosulous hairs or sometimes subglabrous. Panicles corymbiform or cymose on glandular-pubescent peduncles. Pistillate Heads: 7.0-9.0 mm high, 4.0-5.0 mm wide, phyllaries 5-6 seriate, long-acuminate, the outer subulate or perhaps lance-ovate and glandular-pubescent, the inner linear-lanceolate and glabrous; filiform ray flowers 59-73, pappus 5.3-6.6 mm long, white, corollas 3.4-6.6 mm long, white or green-white, puberulous above, the ligules erect, 0.2-0.3 mm long, glabrous or puberulous near the bases, achenes 1.0-1.4 mm long, 2-nerved, shiny and hispidulous; disk flowers 2-11, pappus 5.6-6.8 mm long, corollas 5.4-7.0 mm long, white or green-white, anthers sterile, achenes abortive, inane or reduced to small knobs.

Staminate Heads: 8.0-9.0 mm high, 5.0-6.0 mm wide, phyllaries 4-5 seriate; filiform ray flowers occurring sporadically, 0-12 or perhaps more, pappus ca. 6.4 mm long, corollas ca. 3.8 mm long, white or green-white, achenes perhaps fertile; disk flowers ca. 72, white or green-white, pappus 4.6-6.8 mm long, white, tubes 2.1-3.5 mm long, sparsely puberulous, limb 2.3-4.5 mm long, puberulous, lobes oblong, 1.0-2.2 mm long, puberulous, style branches linear-lanceolate, barely acuminate or narrowly acute, achenes abortive, inane or reduced to small knobs.

Chromosome number: n = 9 (Jackson, 1969), Fig. 1.

Pollen diameters (microns): polar, 23.3-28.3; equatorial, 25.5-31.0; Jackson 1030, Pringle 6257.

Floral illustrations: Fig. 4.

Blake (1927) did not recognize A. hieraciifolia Heer. as valid because Heering "gave no diagnosis." However, Heering explicitly compared differences of his species with Baccharis hieraciifolia Hemsl., thus providing the diagnosis required by Art. 32 of the International Code (Stafleu & Voss, 1972, p. 37). Heering's publication of this name is here regarded as valid.

Archibaccharis oaxacana (based on Baccharis oaxacana Greenm.) and A. hieraciifolia are competing names. Both names were applied to plants from the same collection, Pringle 6257, and were published in the same year, 1904. Personal correspondence in 1973 with Dr. J. A. Leussink of the International Bureau for Plant Taxonomy and Nomenclature, Utrecht, Netherlands, has confirmed that Heering's paper preceded the publication of Baccharis oaxacana Greenm. in 1904. My study of type photos of A. hieraciifolia Heer. (furnished by the Hamburg Herbarium) and the type of B. oaxacana Greenm. show that these plants are members of the same taxon. The correspondence and photos have been deposited with the type collections at the University of Minnesota Herbarium.

A. hieraciifolia var. hieracioides and A. hieraciifolia var. glandulosa are closely related to the present variety. The way in which the leaf blade is abruptly contracted to a petioliform portion is often a distinctive mark for var. hieraciifolia. However, the leaves of Jackson 1029, taken from a clone of pistillate plants growing in open sun do not show this characteristic. A comparison of that collection with Jackson 1030 which was collected directly across the road will demonstrate considerable phenotypic plasticity. The plants from Jackson 1030 were found growing in shade conditions. The number of florets on the pistillate heads may perhaps be used to separate var. hieraciifolia from var. glandulosa. The phyllaries in var. hieraciifolia seem less glandular-pubescent than the other two varieties and their apices are not as noticeably lax.

Abnormal intermediate flowers are sometimes found on the pistillate heads of this variety. Filiform ray flowers may often occur on the margins of the staminate heads.

Camp 2680 (NY) from Zempoaltepetl, Oaxaca, may represent a form of the present variety. The giant features of this plant suggest that it may be polyploid. The staminate heads and flowers are extremely large as are the trichomes.

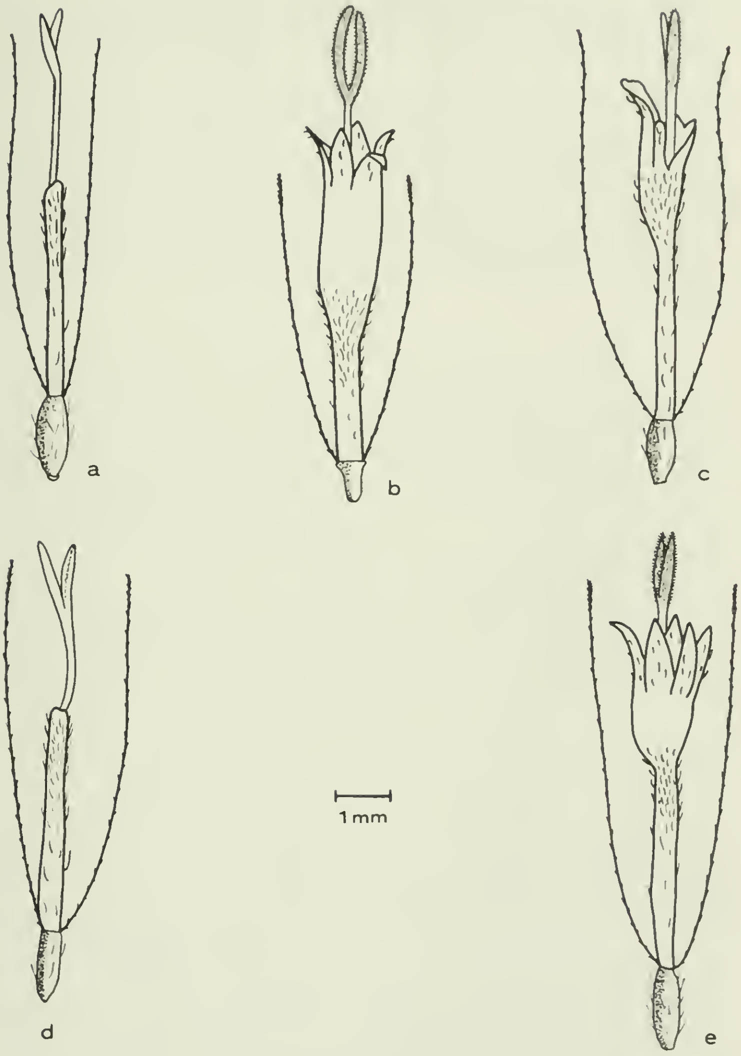

Fig. 4. Floral illustrations of Archibaccharis hieraciifolia var. hieraciifolia (all from Jackson 1030). Pistillate heads: (a) filiform flower, (b) disk flower, (c) abnormal intermediate flower; staminate heads: (d) filiform flower, (e) disk flower. Disk flowers are shown without anthers.

This variety of A. hieraciifolia is known from the state of Oaxaca, Mexico (Fig. 8). The habitat has been described as on shaded slopes and sometimes in more open exposures at 2000-2966 m ele.

MEXICO: State of Oaxaca: 10 miles northeast of Ixtlán de Juarez along road to Tuxtepec, Breedlove 8034 (DS, F, MICH); Cerro de San Felipe, north of Oaxaca (top), Camp 2596 (NY); 11.2 miles north of Ixtlán de Juarez on the road to Tuxtepec, Jackson 1029 (B, BM, C, DS, F, G, GH, K, MICH, MIN, MO, MSC, NY, P, POM, TEX, UC, US, WIS); directly across the road from the preceding collection, Jackson 1030 (B, BM, C, DS, F, G, GH, K, MICH, MIN, MO, MSC, NY, P, TEX, UC, US, WIS); Sierra de San Felipe, Pringle 5669 (GH).

3a. ARCHIBACCHARIS HIERACIIFOLIA Heer. var. HIERACIODES (Blake) J. D. Jackson, Phytologia 28(3): 296-297. 1974. Baccharis hieraciifolia Hemsl. Biol. Centr. Amer. 2: 129. 1881. Not. Lam. 1783. Hemibaccharis hieracioides Blake, Contr. U. S. Nat. Herb. 20: 547. 1924. Archibaccharis hieracioides Blake, Journ. Washington Acad. Sci. 17: 60-61. 1927. Lectotype: MEXICO: State of Mexico: Desierto Viejo, Valley of Mexico, 3 November 1865 or 1866, Bourgeau 1230 (K! photo. MIN!; isolectotypes: C! GH! P! US! photo. of C isolectotype, GH! NY! TEX! photo. and fragments from an undetermined herbarium, MSC!).

Erect ligneous herbs; ca. 2.5-20 dm tall; glandular-pubescent; the bases often procumbent, rhizomatous. Stems straight or obscurely fractiflex, terete or sometimes angled near the decurrent bases of the petioles, the bases 1.5-5.0 mm in diam., graduating to 1.0-3.0 mm above, the internodes 1.0-4.0 cm long, dull or shiny, purple, brown-purple, green, brown-green or brown, glabrescent below then sparsely pilosulous or glandular-pubescent becoming thickly glandular-pubescent above with mostly glandular hairs. Leaves with variable petioles, 2.0-20.0 mm long and naked or often with narrow, quite obscure, decurrent green margins which may or may not continue to the junction of the stems and leaves, glandular-pubescent; blades variable, lanceolate, linear-lanceolate, elliptic, oblong-elliptic, lance-ovate or ovate, 3.0-18.0 cm long, (1.0-)2.0-4.0 cm wide, chartaceous or thinner, cuneate at bases but sometimes continuing decurrently to the stem with a narrow petioliform portion which varies in width from obscure to 7.0-8.0 mm wide, the sessile leaves then obtuse at the stems or with an auriculate-amplexicaul extension, acuminate at apices, or especially older cauline leaves, rarely acute, margins distally serrate, serrulate, merely denticulate or rarely entire, the upper surfaces dark-green, dull, glandular pubescent, the lower surfaces noticeably lighter green, glandular-pubescent, the density of hairs varying, the shorter glandular hairs often obscured by pilosulous and villosulous hairs. Panicles loose and often corymbiform on glandular-pubescent peduncles. Pistillate Heads: 8.0-15.0 mm high, 5.0-8.0 mm wide, phyllaries 4-5 seriate, long-acuminate and lax, the outer subulate, glandular-pubescent, the inner linear-

lanceolate and becoming glabrous; filiform ray flowers (17-)56-99, pappus 5.2-7.4 mm long, white, corollas 5.0-7.0 mm long, white or green-white, puberulous above, the ligules erect, 0.2-1.6 mm long and puberulous, achenes 1.4-2.6 mm long, 2-3 nerved, shiny and hispidulous; abnormal intermediate flowers are sometimes present; disk flowers 2-9(-22), pappus 5.5-7.8 mm long, corollas 6.1-8.6 mm long, white or green-white, anthers sterile, achenes inane, apparently sometimes fertile or reduced to small knobs. Staminate Heads: 8.0-10.0 mm high, 5.0-8.0 mm wide, phyllaries 4-5 seriate; filiform ray flowers occurring sporadically 0-4(-29), pappus 3.0-6.0 mm long, white, corollas sometimes greatly reduced or nearly normal, 1.0-5.5 mm long, white or green-white, achenes abortive, inane and somewhat reduced in size or apparently sometimes fertile; disk flowers 40-67, white or green-white, pappus 4.0-7.0 mm long, white, tubes 1.9-3.8 mm long, puberulous above, limb 3.5-5.3 mm long, puberulous, lobes oblong, 1.6-2.4 mm long, puberulous on both surfaces, style branches linear-lanceolate, barely acuminate or narrowly acute, achenes abortive, inane or reduced to small knobs.

Chromosome number: n = 9 (Jackson, 1969), Fig. 1.

Pollen diameters (microns): polar, 21.2-28.9; equatorial, 25.5-30.0; Jackson 1050, Lyonnet 400.

Floral illustrations: Fig. 5 & 6.

Because of the great morphological similarities of A. hieracioides, A. oaxacana and A. glandulosa, the three species have been reduced to varietal level. The three taxa have similar flowers, overlapping floral measurements and identical pubescence. Blake (1924, p. 546) in discussing A. hieracioides and A. glandulosa, felt that "the two species may perhaps be identical but are best kept distinct until further evidence is available." var. hieracioides may be distinguished by its acuminate leaf apices. The author's field investigations revealed that the leaves of var. hieracioides may have naked petioles or possess a narrow green petioliform portion varying from scarcely noticeable to 7.0-8.0 mm wide, including the midrib. In addition, clasping leaf bases are sometimes found as in var. glandulosa and var. hieraciifolia. Suggestions of such leaf bases are common. The three taxa are now varieties of A. hieraciifolia, cf. discussion of A. hieraciifolia.

Pringle 7709 (US) and Bourgeau 1230 (US) which were cited by Blake (1924, p. 546) as A. glandulosa have been cited in this paper as var. hieracioides. Pringle 7709 (US) was subjected to the cotton blue test. The results showed 85.4% viable pollen. It does not seem that this specimen represents a hybrid between var. hieracioides and var. glandulosa. The three varieties are perhaps not completely genetically isolated.

Hemsley (1881, p. 129) cited two Bourgeau collections, 951 and 1230 as the types of his Baccharis hieraciifolia. In accordance with Chapter II, Sec. 2, Art. 7, Note 1 of the Code (Stafleu & Voss, 1972) Bourgeau 1230 has been selected to serve as the lectotype. In fact, Bourgeau 951 was collected in the Forest of San Nicolas, Valley of Mexico, while Bourgeau 1230 was collected

at Desierto Viejo, Valley of Mexico. Both collections belong to the present variety.

Before Blake transferred all the species he had published under his genus Hemibaccharis (1924, p. 547) to Archibaccharis, he applied a new name to Hemsley's species when he published it as Hemibaccharis hieracioides. The epithet "hieraciifolia" had been used by Lamarck as Baccharis hieraciifolia Lam. 1783. Blake regarded Heering's Archibaccharis hieraciifolia as only a new combination and cited that name "as to synonym only." The present paper recognizes the validity of Heering's A. hieraciifolia.

This variety of A. hieraciifolia sometimes shows filiform pistillate corollas on the edges of the staminate heads. The achenes of these flowers are apparently sometimes fertile as are the achenes of the disk flowers found in the centers of the pistillate heads. It was not uncommon to find abnormal intermediate flowers on the pistillate heads. Even entire heads were found to be abnormally intermediate, composed completely of abnormal flowers. Rzedowski 19442 (TEX) and Purpus 1498 (MO) exhibited such heads.

From Guerrero, Hidalgo, Jalisco, Michoacan, Morelos, San Luis Potosi and Tlaxcala, Mexico (Fig. 8). Moist, shady woods on often steep, rocky and dry slopes, 2185-3800 m ele.

MEXICO: Federal District: Desierto de los Leones, Jackson 1045 (B, BM, C, DS, F, G, GH, K, MICH, MIN, MO, MSC, NY, P, POM, TEX, UC, US, WIS); Desierto de los Leones, Lyonnet 400 (BM, GH, K, MO, NY, US); Desierto de los Leones, Lyonnet 3026 (US); Desierto do los Leones, Rzedowski 15572 (MICH); Desierto de los Leones, Steyermark 52254 (F). State of Guerrero: Teotepec, Hinton 11124 (K, MICH, NY); Cerro Teotepec, Municipio of Talacotepec, Rzedowski 18138 (MICH, MSC, WIS). State of Hidalgo: Cerro de las Ventanas, 6 km north of Pachuca, Rzedowski 18199 (MICH, MSC, TEX, WIS); Cerro de los Gavilanes, east of Estanzuela, Municipio of El Chico, Rzedowski 22027 (MICH, MSC); State of Jalisco: northern slopes of Nevado de Colima, above the sawmill called Piedra Ancha and just east of the first great canyon west of the sawmill site, McVaugh 11611 (MICH); northeastern slopes of Nevado de Colima, below Canoa de Leoncito, at head of Barranca de la Rosa, McVaugh 13400 (MICH). State of Mexico: Mesón Viejo, Hinton 3271 (F, GH, K, MICH, MO, US); slope west of Ixtaccihuatl, 6 km east of San Rafael, Municipio of Tlalmanalco, Holguín 210649 (MSC); Mt. Ixtaccihuatl, Jackson 1050 (F, GH, K, MIN, NY, P, US); Sierra de las Cruces, Pringle 7709 (F, P, POM, US); Mt. Ixtaccihuatl, Purpus 251 (GH, MO, POM, UC, US); Mt. Ixtaccihuatl, Purpus 1498 (1948?) (A, BM, C, GH, DS, NY, P, POM, UC, US); moist barranca 3 km east of San Rafael, Rzedowski 19329 (MICH); slope west of Ixtaccihuatl, 5 km east of San Rafael, Municipio of Tlalmanalco, Rzedowski 25444 (MICH, MSC). State of Michoacan: wooded slopes 8-10 miles northwest and west-northwest of Ciudad Hidalgo, among mountains west of Cerro San Andrés and 6-7 miles north of village of San Pedro Aguaro, McVaugh 9891 (BM, G, GH, MICH, NY, TEX). State of Morelos: Lagunas de Zempoala, Lyonnet 3203 (US). State of San Luis Potosi: San Luis Potosi, d'Aoust 262 (P). State of Tlaxcala: north of

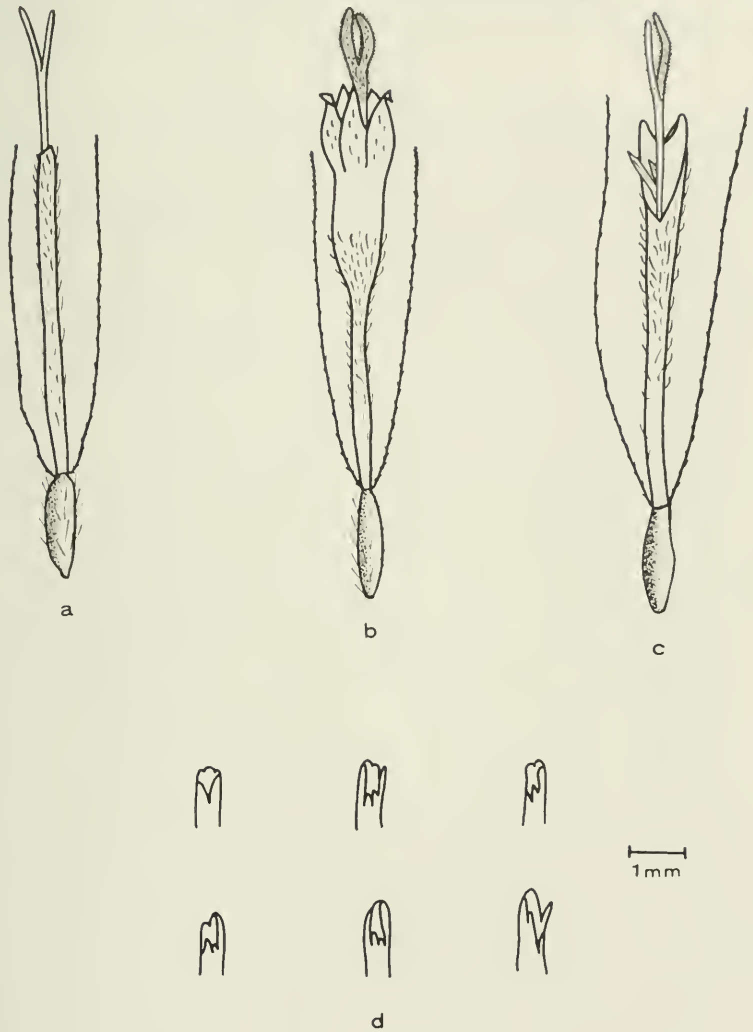

Fig. 5. Floral illustrations from the pistillate heads of Archibaccharis hieraciifolia var. hieracioides. (a) filiform flower (Jackson 1045); (b) disk flower (Jackson 1045); (c) abnormal intermediate flower (Rzedowski 18138); (d) apices of abnormal intermediate flowers (Purpus 1498). Disk flowers are shown without anthers.

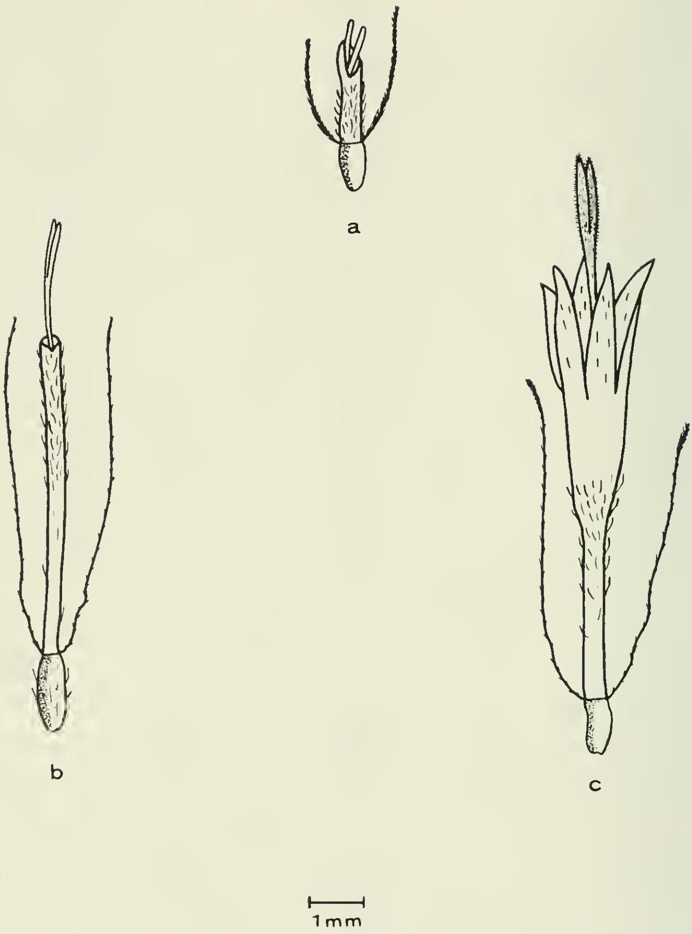

Fig. 6. Floral illustrations from the staminate heads of Archibaccharis hieraciifolia var. hieracioides (all from Jackson 1045). (a) abnormal, reduced filiform flower, (b) filiform flower, (c) disk flower. Disk flowers are shown without anthers.

Cerro La Malinche, 7 km southwest of Rancho de Jesús, Municipio Huamantla, Rzedowski 23794 (MICH, MSC).

3b. ARCHIBACCHARIS HIERACIIFOLIA Heer. var. GLANDULOSA (Greenm.) J. D. Jackson, Phytologia 28(3): 296. 1974. Baccharis glandulosa Greenm., Proc. Amer. Acad. 40: 36-37. 1904. Hemibaccharis glandulosa (Greenm.) Blake, Contr. U. S. Nat. Herb. 20: 546. 1924. Archibaccharis glandulosa (Greenm.) Blake, Journ. Washington Acad. Sci. 17: 60. 1927. Type: MEXICO: Federal District: Serrania de Ajusco, 2895 m ele., 7 December 1903, Pringle 8782 (GH!); isotypes: BM! C! F! K! MICH! MIN! MO! NY! P! POM! UC! US!).

Erect ligneous herbs; ca. 4-5 dm tall; glandular-pubescent; the bases often procumbent, rhizomatous. Stems essentially straight but sometimes fractiflex, terete or sometimes angled near the decurrent bases of the petioles, the bases 2.0-3.5 mm in diam., graduating to 1.0-3.0 mm above, the internodes 0.5-4.0 cm long, somewhat shiny below, rather dull above, brown, red-brown, green or purple, glabrescent below, thickly glandular-pubescent above. Leaves sessile; blades usually narrowing very slightly towards the bases appearing nearly linear throughout or with some of the leaves narrowing more abruptly just below the middle forming a nearly linear or tapering petioliform portion much wider than the widest part of the blades, linear-lanceolate or sometimes elliptic, oblong-elliptic or ovate, 3.5-9.0 cm long, 1.0-2.0 cm wide, thickly chartaceous, always auriculate-amplexicaul at bases with the usually broad, obtuse auricles often wider than the petioliform portions which are 3.0-12.0 mm wide, the older cauline leaves usually abruptly acute or rarely longer and barely acuminate or acute at apices, margins distally serrate, serrulate or merely denticulate, the upper surfaces dark-green or nearly all dark-purple, dull, glandular-pubescent, the lower surfaces lighter green, glandular-pubescent with the shorter, erect glandular hairs often obscured by pilosulous or villosulous hairs or sometimes subglabrous. Panicles corymbiform or cymose on glandular-pubescent peduncles. Pistillate Heads: 7.0-10.0 mm high, 4.0-7.0 mm wide, phyllaries 4-5 seriate, long-acuminate, the outer subulate or barely linear-lanceolate and glandular-pubescent, the inner linear-lanceolate and becoming glabrous; filiform ray flowers 100-127, pappus 5.7-6.6 mm long, white, corollas 3.6-6.1 mm long, white or green-white, puberulous above, the ligules erect, 0.3-0.9 mm long or often obscure, puberulous only near the bases, achenes 1.0-1.6 mm long, 2-nerved, shiny and hispidulous; disk flowers 3-15, pappus 4.7-6.4 mm long, corollas 5.2-7.0 mm long, white or green-white, anthers sterile, achenes abortive, inane or reduced to small knobs. Staminate Heads: 7.0-10.0 mm high, 5.5-8.0 mm wide, phyllaries 4-5 seriate; filiform ray flowers occurring sporadically, 0-3 or perhaps more, pappus 4.7-6.9 mm long, corollas 5.0-5.6 mm long, white or green-white, achenes perhaps fertile; disk flowers 38-93, white or green-white, pappus 4.4-6.1 mm long, white, tubes 2.0-3.6 mm long, puberulous above, limb 3.0-4.7 mm long, puberulous,

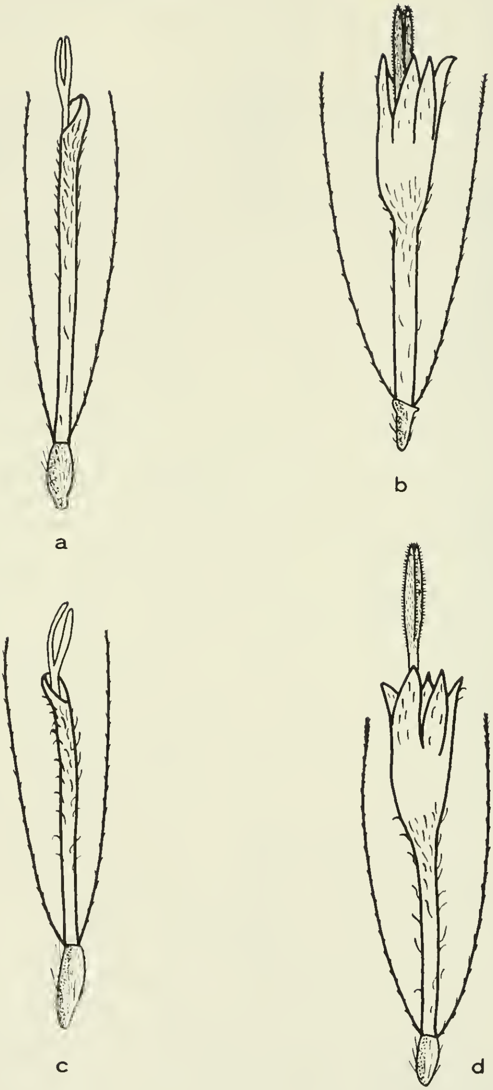

Fig. 7. Floral illustrations of Archibaccharis hieraciifolia var. glandulosa (all from Pringle 8782). Pistillate heads: (a) filiform flower, (b) disk flower; staminate heads: (c) filiform flower, (d) disk flower. Disk flowers are shown without anthers.

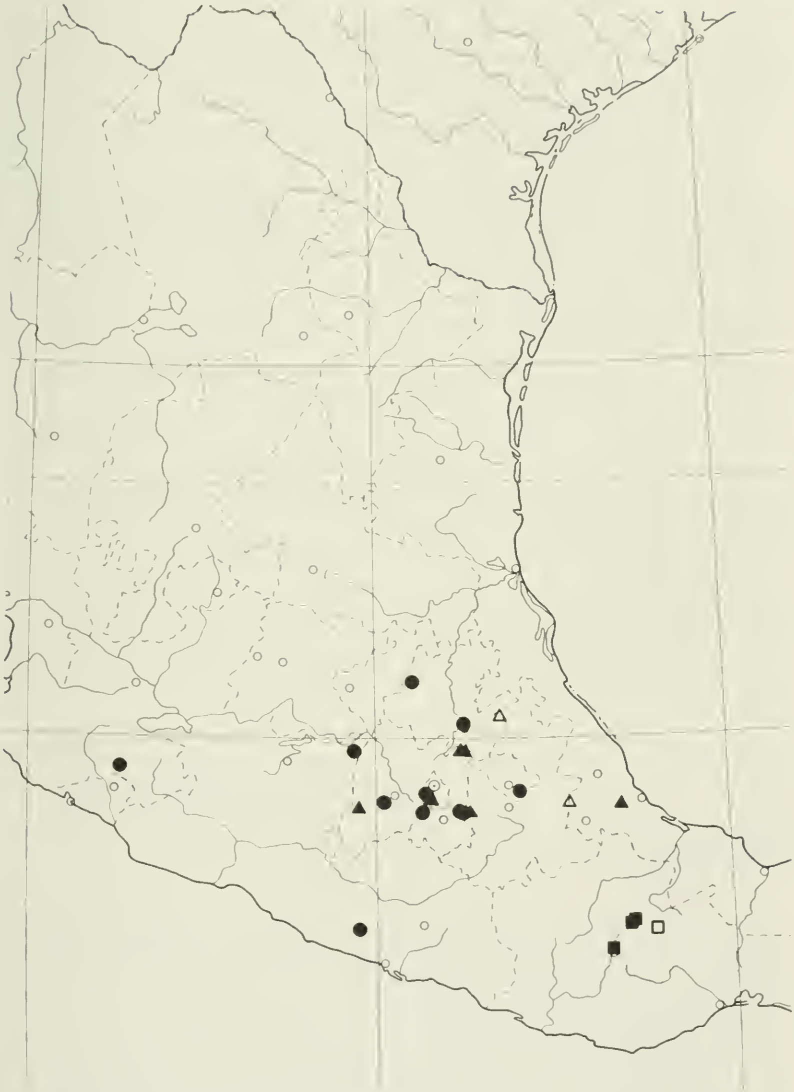

Fig. 8. Distribution of species and varieties of Archibaccharis in Mexico. Open squares, A. campii. Filled triangle, A. hieraciifolia var. glandulosa. Circle, A. hieraciifolia var. var. hieracioides. Filled square, A. hieraciifolia var. hieraciifolia. Open triangle, A. simplex.

lobes oblong, 1.6-2.2 mm long, puberulous on both surfaces, style branches linear-lanceolate, barely acuminate or narrowly acute, achenes abortive, inane or reduced to small knobs.

Pollen diameters (microns): polar, 23.3-27.8; equatorial, 23.9-30.0; Pringle 8782, Rzedowski 22020.

Floral illustrations: Fig. 7.

Archibaccharis hieraciifolia var. glandulosa is morphologically very similar to two other varieties, var. hieracioides and var. hieraciifolia. The present variety is perhaps best distinguished by its usually thicker leaves, linear-lanceolate leaf shape and a greater number of florets on the pistillate heads. The Puebla collection, Purpus 2792, possessed lower cauline leaves similar to those usually associated with var. hieraciifolia.

Blake (1927, p. 60) erred in his reference to Pringle 6257, indicating it was the type number of Baccharis glandulosa Greenm. That number is the type of A. hieraciifolia Heer.

Two collections cited by Blake (1924, p. 546) as A. glandulosa have been cited in this paper as var. hieracioides since the discovery that this taxon can also sometimes possess auriculate-amplexicaul leaf bases and acuminate leaf apices. Pringle 7709 (US) and Bourgeau 1230 (US) possess such characters. New collections are needed, particularly of var. hieraciifolia and var. glandulosa.

Iltis & Iltis 1660a from Cerro Gordo, D. F., looked like var. glandulosa except for slightly acuminate leaf apices. This may provide cause to suspect introgression.

From Federal District, Guerrero, Mexico and Puebla (Fig. 8). Growing in shade and on damp, steep slopes, rocky cliffs or volcanic ash, 2812-3200 m ele.

MEXICO: State of Guerrero: Petlacala, District Mina, Hinton 15405 (GH, US). State of Mexico: Crucero de Agua Blanca, Hinton 8823 (F, GH, K, MICH, MO, US); Mt. Ixtaccihuatl, Purpus 296 (MO); slope north of Cerro Gordo, around San Martín de las Pirámides, Rzedowski 22020 (MICH, MSC, WIS). State of Puebla: Boca del Monte, Purpus 2792 (BM, F, GH, MO, NY, UC, US).

4. ARCHIBACCHARIS SUBSESSILIS Blake, Brittonia 2: 339-340. 1937.

Type: GUATEMALA: Dept. Quiche: on bushy slope, Nebaj, 1920 m ele., 20 November 1934, Skutch 1736 (A! photo. MIN!; isotypes: BM! F! NY! US!).

Erect shrubs; ca. 5-29 dm tall; rhizomatous. Stems straight below, straight or obscurely fractiflex above, terete, the bases 1.5-7.0 mm in diam., graduating to 1.5-5.0 mm above, the internodes 0.5-4.5 cm long, somewhat shiny, brown, yellow-brown, red-brown, greenish, whitish or purple, glabrescent below, thickly puberulous above, the weak brown and white or purple hairs often nearly erect and mixed with superficial amber glands. Leaves with short petioles, 1.5-3.5(-4.0) mm long, puberulous; blades ovate, oblong-ovate, elliptical, oblong-elliptic or lanceolate, 3.0-10.0 cm long, 2.0-5.0 cm wide, firmly chartaceous, usually shallowly cordate at bases, rarely rounded, long or short-

acuminate at apices, margins distally serrulate or serrate, the upper surfaces dark-green or olive-green, dull, hispidulous and often with scattered or dense superficial amber glands, the lower surfaces lighter green, dull, sparsely hispidulous or subglabrous, often with scattered or dense superficial amber glands, the hairs denser than those on the upper surfaces. Panicles convex on densely puberulous peduncles, the hairs mixed with some superficial amber glands. Pistillate Heads: 4.0-6.0(-8.0) mm high, 2.5-3.2 mm wide, phyllaries 4-5 seriate, acute or acuminate, the outer triangular or oblong-lanceolate and somewhat puberulous, these hairs mixed with superficial amber glands, the inner becoming linear-lanceolate and glabrous; filiform ray flowers 17-29, pappus 3.1-4.3 mm long, white, corollas 3.2-4.2 (-4.8) mm long, white, green-white or sometimes purple, puberulous above, the ligules erect or obliquely reflexed, 1.2-2.2 mm long, achenes 0.8-1.7 mm long, (2-)3(-4) nerved, shiny and hirtellous with superficial whitish or light-amber glands; disk flowers 1-7, pappus 3.0-4.2 mm long, corollas 3.3-4.4(-4.8) mm long, white, green-white or sometimes purple, anthers sterile, achenes inane. Staminate Heads: 4.0-5.5(-6.0) mm high, 3.0-4.0 mm wide, phyllaries 4-5 seriate; filiform ray flowers 4-14, pappus 2.2-3.4 mm long, corollas 3.0-4.6 mm long, white, green-white or sometimes purple, achenes inane or apparently sometimes fertile; disk flowers 17-38, white, green-white or sometimes purple, pappus 2.5-3.5 mm long, white, tubes 1.1-1.9 mm long, puberulous above, limb 1.6-2.5 mm long, puberulous with rather blunt hairs, lobes triangular or oblong, 1.2-1.6 mm long, puberulous on the dorsal surfaces, style branches oblong, acute, achenes abortive, reduced to small knobs.

Chromosome number: n = 9 (Jackson, 1969), Fig. 1.

Pollen diameters (microns): polar, 16.7-19.0; equatorial, 19.0-23.3; Breedlove 8793, Jackson 1033.

Floral illustrations: Fig. 9.

The pistillate and staminate heads of A. subsessilis are always heterogamous. In that character and in the possession of well-developed ligules on the filiform corollas this species resembles A. corymbosa and A. linearilobis. Study revealed that despite the presence of ray and disk flowers on all heads, the species appears to be largely dioecious due to evolutionary loss. It is conceivable that the recognition of pistillate and staminate heads was long prevented because of the mixture of floral types on all heads. This generic character was not described by Blake (1924, pp. 544-545). The wider staminate heads appear to always possess a smaller number of filiform ray flowers (4-14) than the narrower pistillate heads (17-29). The achenes of the filiform ray flowers of the staminate heads are apparently rarely fertile. The staminate heads also have a greater number of disk flowers (17-38) than the pistillate heads (1-7). The anthers of the disk flowers are functional in the staminate heads but they are sterile in the disk flowers of the pistillate heads. The achenes of the disk flowers are abortive on both pistillate and

staminate heads. Thus, the loss of flowers, flower parts and functions strongly suggests evolution of dioecious plants with unisexual flowers from gynomonoecious plants.

Steyermark 36981 from Dept. San Marcos, Guatemala was reported by the collector as a sprawling vine. This was the only report of the scandent habit for this species. Otherwise, the characters of the plant correspond well to those of *A. subsessilis*. Steyermark's collection may have been of an abnormal growth form.

Heyde & Lux 3389 (GH, US), cited by Blake (1924, p. 548) as possibly being the staminate specimen of *A. salmeoides*, has been cited in this paper as *A. subsessilis*. Some representatives of that collection possessed the superficial amber leaf glands and floral characters typical of this species.

The exact position of Mt. Pasitar, Chiapas was not ascertained. Matuda collections of *A. subsessilis*, *A. Schiedeana* and *A. serratifolia* from that location were not shown on their respective distribution maps in this study.

From Chiapas, Mexico and Huehuetenango, Quiché and San Marcos, Guatemala (Fig. 10).

GUATEMALA: Dept. Huehuetenango: one mile north of Santa Eulalia along road to San Mateo Ixtatán, Breedlove 8576 (DS, F, MICH); 4 miles east of San Mateo Ixtatán on road to Barrillas, Breedlove 8763 (DS, F); 5 miles north of Santa Eulalia along road to San Mateo Ixtatán, Breedlove 8793 (DS, F); above Macx, between Todos Santos and San Martin, Steyermark 51897 (F). Dept. Quiché: San Miguel Uspantán, Heyde & Lux 3389 (F, G, GH, K, US). Dept. San Marcos: along quebrada Canjulá, between Sibinal and Canjulá, Volcán Tacaná, Steyermark 36046 (F); between Todos Santos and Finca El Porvenir, lower to middle slopes of Volcán Tajumulco, Steyermark 36981 (F); Puente de Nahuatl-aa, near San Marcos, Standley 66251 (F); slopes of Cerro Tumbador, about 15 km west of San Marcos, Williams, Molina & Williams 23055 (GH, NY); near Aldea Fraternidad, between San Rafael Pie de la Cuesta and Palo Gordo, west-facing slope of the Sierra Madre Mountains, Williams, Molina & Williams 25815 (F, G, NY). MEXICO: State of Chiapas: slope 5 miles north of Chamula Center along road to Chenalhó, Municipio of Chamula, Breedlove & Raven 8145 (F, MICH); 3.3 miles north of Chamula on the road to Chenalhó, Jackson 1033 (A, B, BM, C, DS, F, G, GH, K, MICH, MIN, MO, MSC, NY, P, POM, TEX, UC, US, WIS); Mt. Pasitar, Matuda S-35 (MICH); Mt. Ovando, Matuda S-50 (MICH); Mt. Pasitar, Matuda 0741 (MICH); Paraje Shahleh in Municipio of Tenejapa, Ton 562 (DS, MSC, NY, WIS); slope in the Paraje of Matsab, Municipio of Tenejapa, Ton 1965 (DS, MICH); slope in the Colonia 'Ach'lum, Municipio of Tenejapa, Ton 1995 (DS, MICH).

5. ARCHIBACCHARIS LINEARILOBIS J. D. Jackson, Phytologia 28(3): 300-302. Fig. 2. 1974. Type: GUATEMALA: Dept. Huehuetenango: steep, rocky slopes along road to San Juan Ixcoy, Sierra Cuchumantanes, 3700 m ele., 12-23 January 1966, Molina,

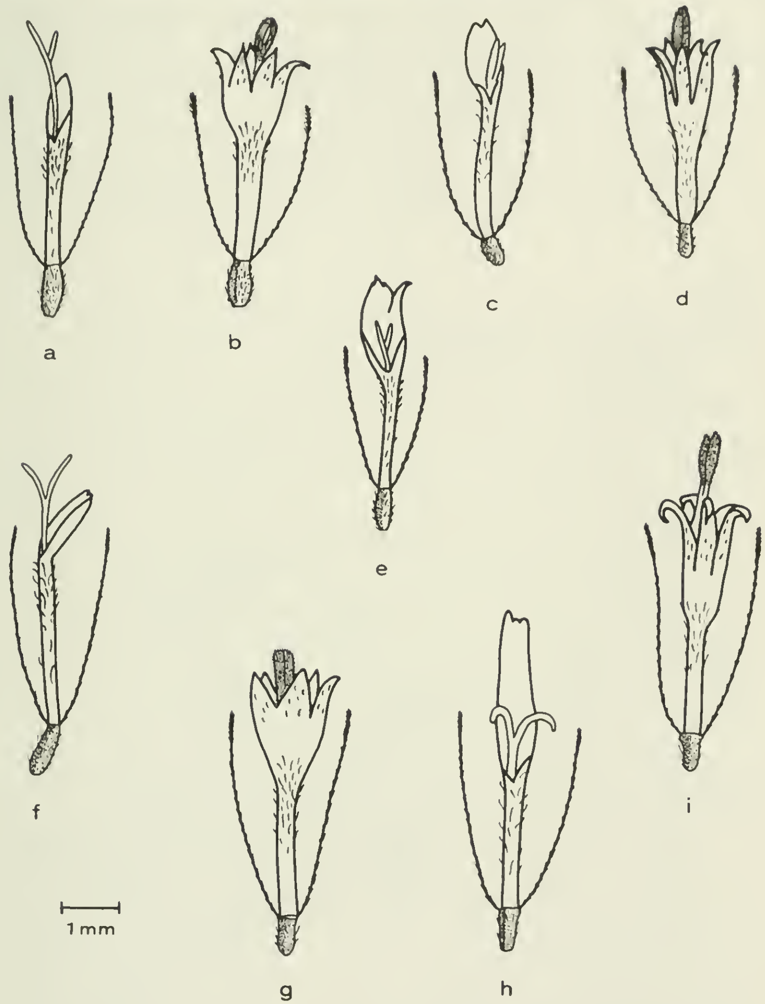

Fig. 9. Floral illustrations of Archibaccharis subsessilis and A. linearilobis. A. subsessilis (all from Jackson 1043): (a, b) pistillate heads: (a) filiform flower, (b) disk flower; (c, d, e) staminate heads: (c) filiform flower, (d) disk flower, (e) abnormal intermediate flower. A. linearilobis (all from Molina, Burger & Wallenta 16446: (f, g) pistillate heads: (f) filiform flower, (g) disk flower; (h, i) staminate heads: (h) filiform flower, (i) disk flower. Disk flowers are shown without anthers.

Fig. 10. Distribution of Archibaccharis subsessilis in Mexico and Guatemala.

Burger & Wallenta 16446 (F! photo. MIN!; isotype: NY!).

Known only from the type location (Fig. 12). Although reported as herbaceous, this species may be a woody shrub. Ca. 15 dm tall, densely glandular pubescent above; leaves ovate, oblong-ovate or elliptical, 3.5-6.0 cm long, 1.5-3.0 cm wide, short-acuminate at apices; panicles convex, the pistillate heads ca. 6.0 mm high, the staminate heads ca. 7.0 mm high.

Pollen diameters (microns): polar, 22.2-28.9; equatorial, 24.4-32.1; Molina, Burger & Wallenta 16446.

Floral illustrations: Fig. 9.

6. ARCHIBACCHARIS CORYMBOSA (Donn. Smith) Blake, Journ. Washington Acad. Sci. 17: 60. 1927. Diplostephium corymbosum Donn. Smith, Bot. Gaz. 23: 8. 1897. Hemibaccharis corymbosa (Donn. Smith) Blake, Contr. U. S. Nat. Herb. 20: 553. 1924. Type: GUATEMALA: Dept. Huehuetenango: Hacienda de Chancol, 3355 m ele., 2 January 1896, Nelson 3639 (US!; photo. MIN!; isotype: GH!).

Erect ligneous herbs; ca. 1.5-20 dm tall; pubescence soft and variable; rhizomatous. Stems straight below, obscurely fractiflex above, terete, the bases 1.5-4.0 mm in diam., graduating to 2.0-4.0(-4.5) mm above, the internodes 1.0-5.0 cm long, rather dull, tan, dark-brown, gray or grayish-purple, glabrescent below, villosulous above. Leaves with petioles (2-)11-15 mm long, hirtellous; blades oblong, elliptic or more rarely with linear or obovate shapes, 5.0-12.0 cm long, 1.0-4.0 cm wide, chartaceous but sometimes thickly so, cuneate at bases, less often obtuse, acuminate at apices, margins distally serrulate or serrate, the upper surfaces dark-green, dull, hirtellous, usually with superficial amber glands, the lower surfaces lighter green, dull, velutinous but with varying density, these hairs mixed with superficial amber glands. Panicles rather flat or rounded on villosulous peduncles. Pistillate Heads: 5.0-7.0 mm high, 2.5-4.0 mm wide, phyllaries 4-5 seriate, the centers green or red, acute or obtuse, sometimes acuminate, the outer subulate and densely villosulous, the inner linear-lanceolate and becoming glabrous; filiform ray flowers 27-34(-40), pappus 3.2-3.9 mm long, white below, bright red or pink near the apices, rarely yellow-tinged, corollas 3.8-5.2 mm long, of varying shades of pink to purple at maturity, sometimes white below but rarely entirely white, the ligules erect or obliquely reflexed, 1.6-2.8 mm long, achenes 0.9-1.4 mm long, 2-4 nerved but mostly trigonous, shiny and hispidulous, these hairs sometimes sparse and mixed with superficial amber glands; disk flowers 1-3(-4), pappus 3.2-3.9 mm long, corollas 3.4-4.2 mm long, of varying shades of pink to purple at maturity, rarely white, anthers sterile, achenes abortive, inane or reduced to small knobs. Staminate Heads: 5.0-8.0 mm high, 3.0-5.0 mm wide, phyllaries 3-4 seriate; filiform ray flowers 12-23, pappus 2.7-3.4 mm long, corollas 4.0-4.8 mm long, of varying shades of pink to purple at maturity, rarely white, achenes often full, perhaps fertile; disk flowers 29-38, of varying shades of pink to purple at maturity, rarely white,

pappus 3.0-3.7 mm long, white below, bright red or pink near the apices, rarely yellow-tinged, tubes 1.5-2.0 mm long, puberulous above, limb 1.9-2.4 mm long, sparsely puberulous, lobes oblong or merely acute, 1.0-1.2 mm long, sparsely puberulous on the dorsal surfaces, style branches oblong, abruptly acute or shortly acuminate, achenes abortive, reduced to small knobs.

Chromosome number: n = 9 (Jackson, 1969), Fig. 1.

Pollen diameters (microns): polar, 13.3-23.3; equatorial, 16.7-25.5; Jackson 1043, Williams, Molina & Williams 22998.

Floral illustrations: Fig. 11.

This species may now be retained in the genus Archibaccharis with more certainty. Blake (1924, p. 553) expressed some doubt as to his placement of this species in Archibaccharis due to the apparent lack of a staminate specimen. My examination of the type specimen, Nelson 3639 (US), indicated that the disk flowers of the heterogamous heads bore functional anthers and very probably was a functional staminate plant. As with A. subsessilis and A. linearilobis, the heads on both pistillate and staminate plants are always heterogamous, possessing both ray and disk flowers. These heads should probably be regarded as possessing more primitive characters than the taxa in which only the pistillate plant remains with heterogamous heads. The pattern of evolutionary loss in A. corymbosa parallels that found in the above mentioned species, cf. the discussion of A. subsessilis.

Williams, Molina & Williams 23158 from Cerro María Tecum, Dept. Totonicapán, was reported as having flowers white or reddish. All other collections examined had flowers of shades from pink to purple, apparently to purple at maturity.

During my examination of Jackson 1043 a form was found which possessed a long, rigid, black, often branched pubescence on the staminate heads. The style branches of both the filiform ray flowers and the disk flowers as well as the anther sacs of the disk flowers exhibited this character.

From Chimaltenango, Huehuetenango, Quezaltenango, San Marcos, Totonicapán and Sacatepéquez (Fig. 12). Collected in moist, mountainous forests and open, dry mountainsides, 2400-3700 m ele.

GUATEMALA: Dept. Chimaltenango: Santa Elena on Cerro de Tecpán, Jackson 1043 (A, B, BM, C, DS, F, G, GH, K, MICH, MIN, MO, MSC, NY, P, POM, TEX, UC, US, WIS); Volcán de Agua, Johnston 581 (F); Santa Elena, Skutch 173 (NY, US); buena vista above Tecpán, Skutch 772 (DS, GH, US); Cerro de Tecpán, region of Santa Elena, Standley 58673 (F, GH); Cerro de Tecpán, region of Santa Elena, Standley 61029 (F). Dept. Huehuetenango: from Hacienda de Chancol, Nelson F 576068 (F); mountains near Hacienda de Chancol, Nelson 3644 (GH tracing, US); Sierra de los Cuchumantanes, along road beyond La Pradera, km 32, Standley 81782 (F). Dept. Quezaltenango: Cantón La Esperanza about 6 km from San Juan Ostuncalco, Molina, Burger & Wallenta 16641 (F, NY); mountains southeast of Palestina, on old road to San Juan Ostuncalco, Standley 84311 (F, G); Volcán Santo Tomás, Steyermark 34809 (F, US); about 5 km north of Ostuncalco, Williams, Molina & Williams 25474 (NY). Dept. Sacatepéquez: slopes of Volcán de Agua, above

Santa María de Jesús, Standley 65208 (F). Dept. San Marcos: indicated by personal correspondence with Dr. Dorothy Nash, Field Museum, Chicago, Williams, Molina & Williams 25925 (F). Dept. Totonicapán: forest of María Tecúm, Molina, Burger & Wallenta 16397 (F, NY); region of Chiu Jolóm, mountains above Totonicapán, on road to Desconsuelo, Standley 84409 (F); about 10 km airline south of Totonicapán, Williams, Molina & Williams 22916 (NY); Cerro María Tecúm, 10-20 km east of Totonicapán, Williams, Molina & Williams 23158 (BM, UC).

7. ARCHIBACCHARIS STANDLEYI Blake var. STANDLEYI, Journ. Washington Acad. Sci. 19: 271. 1929. Type: HONDURAS: Dept. Comayagua: vicinity of Siguatepeque, ele. 1080-1400 m, 14-27 February 1928, Standley 56193 (US!; photo. MIN!; isotypes: F! fragments, G!).

Erect shrubs; ca. 4-12 dm tall; rhizomatous. Stems obscurely fractiflex, terete or round-angled, the bases 1.5-3.2 mm in diam., graduating to ca. 1.0 mm above, the internodes 7.0-22.0 cm long, somewhat shiny, brown or purple, puberulous below, thickly puberulous with incurved brown hairs above. Leaves with petioles 1.0-3.0 mm long, puberulous; blades ovate or lance-ovate, 4.0-6.0 cm long, 1.5-2.5 cm wide, firmly chartaceous, rounded or subcordate at bases, long or short-acuminate and sometimes falcate at apices, margins distally serrulate or crenate, rarely subentire or entire, the upper surfaces dark-green, dull, densely hispidulous with antrorse hairs, the lower surfaces lighter green, dull, very sparsely hispidulous and dotted with superficial amber glands. Panicles convex on densely puberulous peduncles, the hairs mixed with superficial amber glands. Staminate Heads: 4.0-7.0 mm high ca. 3.0 mm wide, phyllaries 4-6 seriate, acute or acuminate, the outer triangular or oblong-lanceolate, puberulous, the inner linear-lanceolate and with few hairs; filiform ray flowers 2-5, pappus 2.8-4.2 mm long, white, corollas 2.6-3.9 mm long, white, the ligules erect, 0.7-1.2 mm long, achenes inane or apparently sometimes fertile, 0.8-0.9 mm long, 3-4 nerved, somewhat shiny and hispidulous, the hairs often irregularly mixed with whitish glandular hairs or superficial whitish glands; abnormal intermediate flowers may be present; disk flowers 7-15, white, pappus 3.4-4.6 mm long, white, tubes 1.7-2.2 mm long, puberulous above, limb 1.9-3.3 mm long, puberulous, lobes linear, 1.8-3.0 mm long, sparsely puberulous on the dorsal surfaces with some superficial whitish glands near the apices, style branches oblong or barely subclavellate, acute, achenes abortive, stipitiform.

Pollen diameters (microns): all preparations showed grains with abnormal forms although the protoplasts stained well; Standley 56193, Standley 56356.

Floral illustrations: Fig. 11.

A. Standley var. Standleyi is still inadequately known. The pistillate plant has not been collected.

This species is very closely related to A. Standleyi var. aequivenia from southern Mexico and Guatemala. The two taxa

differ in leaf morphology, number of florets on the staminate heads and perhaps also in the size of the plants. A. subsessilis from southern Mexico and Guatemala also shares characters with these taxa.

The admixture of floral types on the staminate heads reported by Blake (1929, p. 271) has been confirmed. The completely formed filiform ray flowers, though few, sometimes appear to be fertile. In addition, abnormal intermediate flowers were found.

Known only from the type locality in Comayagua, Honduras (Fig. 13). Collected on brushy and open rocky banks, 1080-1400 m ele.

HONDURAS: Dept. Comayagua: vicinity of Siguatepeque, Standley 56356 (F).

7a. ARCHIBACCHARIS STANDLEYI Blake var. AEQUIVENIA Blake, Brittonia 2: 340-341. 1937. Archibaccharis aequivenia (Blake) D. Nash, Fieldiana 36(9): 73. 1974. Type: GUATEMALA: Dept. Suchitepéquez: roadside bank, Finca Mocá, 937 m ele., 4 January 1935, Skutch 2056 (A!; photo. MIN!; isotype: F!).

Erect shrubs; ca. 19 dm tall; the subterranean parts and bases not seen. Stems obscurely fractiflex, terete or round-angled, 1.5-4.5 mm in diam. above, the internodes 5.0-34.0 cm long, barely shiny, brown, red-brown or dark gray-green, thickly brown or whitish puberulous above. Leaves with short petioles, 1.0-3.0 mm long, sometimes sessile, puberulous, often with pilosulous hairs; blades lanceolate, lance-elliptic or oblong-elliptic, 4.0-16.0 cm long, 1.5-3.5 cm wide, thinly chartaceous, cuneate or narrowly obtuse at bases, long-acuminate or often falcate at apices, margins distally serrulate, the upper surfaces dark-green, dull, finely hispidulous, the hairs often directed antrorsely and dotted with superficial amber glands, the lower surfaces lighter green, dull or somewhat shiny, sparsely hispidulous and often dotted with superficial amber glands. Panicles convex on densely puberulous peduncles. Pistillate Heads: 4.5-5.0 mm high, 2.5-3.0 mm wide, phyllaries 3-4 seriate, acute or acuminate, the outer narrowly triangular or oblong and puberulous, sometimes mixed with superficial amber glands, the inner lanceolate or linear-lanceolate and essentially glabrous; filiform ray flowers 26-31, pappus 2.9-3.7 mm long, white, corollas 2.7-3.0 mm long, white, puberulous above, the ligules erect, 0.4-1.0 mm long, achenes 1.4-1.6 mm long, 3-5 nerved, dull and hispidulous or perhaps sometimes hirtellous and with scattered superficial glands; disk flowers 1-3, pappus 2.8-3.6 mm long, corollas 3.2-3.5 mm long, white, anthers sterile, achenes inane or apparently sometimes fertile. Staminate Heads: ca. 8.0 mm high, 6.0 mm wide, phyllaries 3-4 seriate; filiform ray flowers 1 or more, pappus 2.8 mm long, corollas 2.2 mm long, white, achenes inane or apparently sometimes fertile; disk flowers 22-25, white, pappus 3.2-3.4 mm long, white, tubes 1.5-1.7 mm long, puberulous above, limb 1.9-2.6 mm long, puberulous, lobes linear, 1.8-2.3 mm long, sparsely puberulous on the dorsal surfaces, style

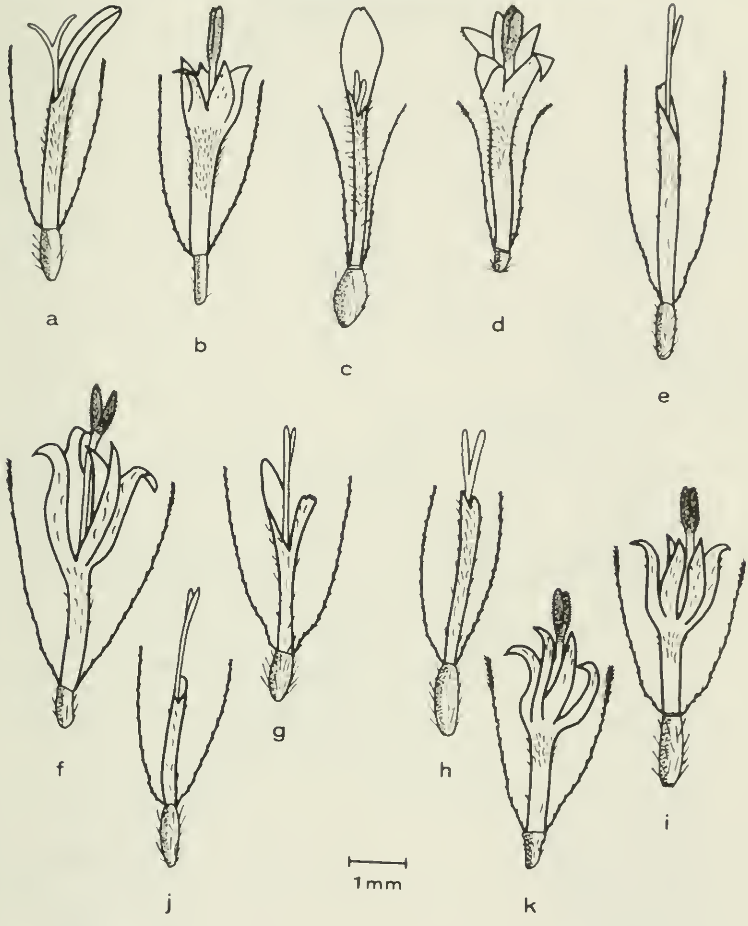

Fig. 11. Floral illustrations of Archibaccharis corymbosa, A. Standleyi var. Standleyi and A. Standleyi var. aequivenia. A. corymbosa (all from Jackson 1043): (a, b) pistillate heads: (a) filiform flower, (b) disk flower; (c, d) staminate heads: (c) filiform flower, (d) disk flower. A. Standleyi var. Standleyi (all from Standley 56356): (e, f, g) staminate heads: (e) filiform flower, (f) disk flower, (g) abnormal intermediate flower. A. Standleyi var. aequivenia: (h, i) pistillate heads (Skutch 2056): (h) filiform flower, (i) disk flower; (j, k) staminate heads (Matuda 4011): (j) filiform flower, (k) disk flower. Disk flowers are shown without anthers.

Fig. 12. Distribution of species of Archibaccharis in Guatemala. Square, A. corymbosa. Triangle, A. linearilobis.

Fig. 13. Distribution of varieties of Archibaccharis in Mexico and Guatemala. Triangle, A. Standleyi var. aequivenia. Circle, A. Standleyi var. Standleyi.

branches oblong or just linear, acute but sometimes obtuse, achenes abortive, inane or reduced to small knobs.

Pollen diameters (microns): polar, 21.0-23.3; equatorial, 22.2-24.4; Matuda 4011.

Floral illustrations: Fig. 11.

The staminate specimen of A. Standleyi var. aequivenia, unknown to Blake, may now be described. These heads appear to be at least sporadically heterogamous.

A. Standleyi var. aequivenia is closely related to A. Standleyi var. Standleyi from Honduras. The two taxa perhaps represent distinct biological species. The evidence currently available seemed insufficient to justify this decision.

Pubescence found on the two taxa is very similar. They differ vegetatively mainly in leaf characters. The leaves of var. aequivenia are much larger, thinner and lanceolate with rounded or subcordate bases. In the var. Standleyi the leaves are shorter, thicker and ovate or lance-ovate with strong lateral veins on the lower leaf surfaces. The bases are nearly cuneate or narrowly rounded.

Pistillate specimens of var. Standleyi are unknown (only three staminate specimens were available). A comparison of staminate head floral characters found them to be nearly indistinguishable except the heads of var. Standleyi had 7-15 disk flowers, those of var. aequivenia 22-25. This may provide a strong case for biological distinctness if further studies provide statistically significant differences. There is a need to demonstrate that the few known staminate specimens of var. Standleyi are not aberrant. These specimens were examined and found to possess abnormal pollen grains. They were deformed and could not be measured although the protoplasts appeared to stain well with cotton blue. New collections of both taxa are needed.

The heads from a pistillate specimen of Matuda 0700 from Mt. Ovando, Chiapas possessed central disk flowers bearing apparently fertile achenes but sterile anthers. The contents of one boiled achene appeared to be fully developed.

From Chiapas, Mexico and Quezaltenango and Suchitepequez, Guatemala (Fig. 13). Collected along roadside banks and on high barranco, 937-1300 m ele.

GUATEMALA: Dept. Quezaltenango: high barranco along Río Samalá, between Santa Maria de Jesús and Calahuachém, Steyermark 33893 (F). MEXICO: State of Chiapas: Mt. Ovando, Matuda 0700 (MICH, US); Mt. Ovando, Matuda 4011 (GH, MICH, MO, NY); Mt. Ovando, Matuda 16236 (US); Cerro del Boquerón, Purpus 6687 in part (BM, F, GH, MO, UC, US).

8. ARCHIBACCHARIS ASPERIFOLIA (Benth.) Blake, Contr. U. S. Nat. Herb. 23: 1509. 1926. Baccharis asperifolia Benth., Pl. Hartw. 86. 1841. Conyza asperifolia Benth. & Hook., Hemsl. Biol. Centr. Amer. Bot. 2: 126. 1881. Hemibaccharis asperifolia (Benth.) Blake, Contr. U. S. Nat. Herb. 20: 552. 1924. Type: GUATEMALA: Dept.

GUATEMALA: mountains of Mixco, 1840, Hartweg 589 (K!; photo. MIN!; isotypes: fragments, BM?! GH! K! NY! P!; photo. TEX!).

Baccharis scabridula T. S. Brandeg., Univ. Calif. Publ. Bot. 6: 77. 1914. Type: MEXICO: State of Chiapas: collected in the high region of Cerro del Boquerón, August 1913, Purpus 6665 (UC!; photo. MIN!; isotypes: BM! F! GH! MO! NY! US!).

Erect ligneous herbs (?); ca. 10-30(-65) dm tall; roots fibrous. Stems straight below, usually obscurely fractiflex above, terete, usually glaucescent at least below, the bases 3.0-12.0 mm in diam., graduating to 1.0-4.0 mm above, the internodes 2.0-8.0 cm long, shiny, usually red-purple or dark-purple but sometimes green, glabrous usually to just below the inflorescences, often whitish tomentulose but sometimes subglabrous. Leaves with petioles 2.0-15.0(-20) mm long, essentially glabrous below, puberulous or subglabrous above; blades usually elliptical or lance-elliptic but sometimes obovate, oblanceolate, rarely ovate or oblong-ovate, 2.0-14.5 cm long, 1.0-5.0 cm wide, chartaceous or thickly so, attenuate, cuneate or variously obtuse at bases, acuminate, short-acuminate or rarely obtuse at apices, margins distally serrate, serrulate or merely denticulate, rarely entire, scabrous or with some pilosulous hairs, the upper surfaces dark-green, dull, usually scabrous but sometimes puberulous or thinly hirtellous, rarely subglabrous, the lower surfaces lighter green, dull, often with pilosulous and hirtellous hairs, rarely subglabrous. Panicles convex or pyramidal on subglabrous to tomentulose peduncles, the hairs sometimes crisped. Pistillate Heads: 4.0-5.5(-7.5) mm high, 3.0-4.5(-6.0) mm wide, phyllaries 4(-5) seriate, acute or rarely acuminate, the outer and inner ones linear-lanceolate, glabrous; filiform ray flowers 25-55(-69), pappus 2.4-3.6(-4.0) mm long, white, rarely brown-tinged or rufous, corollas 1.9-3.0(-3.8) mm long, white or cream-white, puberulous above, the ligules erect, 0.1-0.6 mm long, achenes 0.9-1.5(-1.8) mm long, (2-)3(-4) nerved somewhat shiny and hispidulous; disk flowers 1-7, pappus 2.4-3.4 (-4.1) mm long, corollas 2.8-4.1(-4.6) mm long, white or cream-white, anthers sterile, achenes inane or apparently sometimes fertile; abnormal intermediate flowers sometimes present. Staminate Heads: 4.0-5.5(-7.0) mm high, 3.0-4.0(-5.5) mm wide, phyllaries ca. 4 seriate; filiform ray flowers occurring sporadically, 0-4, pappus ca. 2.2 mm long, corollas 1.6-2.0 mm long, white or cream-white, achenes inane or apparently sometimes fertile; abnormal intermediate flowers sometimes present; disk flowers 22-44(-56), white or cream-white, pappus 2.3-3.3(-3.7) mm long, white, rarely brown-tinged or rufous, tubes 1.1-1.8(-2.2) mm long, puberulous above, limb 1.5-2.9 mm long, puberulous, lobes triangular or oblong, 0.8-1.5 mm long, sparsely puberulous on the dorsal surfaces, style branches oblong, barely lanceolate or linear, acute, achenes abortive, reduced to small knobs.

Chromosome number: n = 9 (Jackson, 1969), Fig. 1; n = 9 (Solbrig et al., 1969).

Pollen diameters (microns): polar, 17.8-20.0; equatorial, 20.0-22.2; Jackson 1039, Standley 61051.

Floral illustrations: Fig. 14.

Archibaccharis asperifolia is usually distinct with its combination of usually elliptical leaves with scabrous upper surfaces and terete, shiny, purple or green glabrous stems with noticeably ascending branches above.

A. asperifolia was observed by the author throughout much of its range. This species appears to possess herbaceous stems which develop considerable woody tissue in one growing season. The stem becomes rather woody and rigid. Stem cross-sections taken from larger specimens indicated only one year's growth. In contrast, A. sescenticeps, a closely related species, clearly possesses periennial stems. Examples were examined which exhibited several seasons accumulation of wood.

As with other Archibaccharis taxa, this species presented many examples of sporadically occurring filiform ray flowers on the staminate heads. Abnormal intermediate flowers were found on both staminate and pistillate heads.

Although the vegetative and floral characters matched very well with those of A. asperifolia, the large pistillate and staminate heads found on Rzedowski 2198 from Tlalmanalco, State of Mexico, probably represents an extreme variation of the species. Staminate specimens from a Müller collection, probably from Vera Cruz, were similarly large. In fact, Blake had made a pencil note on the Müller sheet (NY), "probably, but heads very large," giving his response to the handwritten label on the sheet, "Baccharis asperifolia."

From Jalisco and San Luis Potosi, Mexico, south to northern Nicaragua, a widespread species (Fig. 15). Collected in high, damp forested zones and on rocky slopes, 1260-3900 m ele. One collection was taken from the cinder cone of Volcán Atitlán in Guatemala. The author has not infrequently noted this species along roadsides in rather open exposures throughout much of its distribution.

GUATEMALA: Dept. Alta Verapaz: southeast of Cobán adjacent to gravel road to San Juan Chamelco, Jackson 1039 (F, GH, K, MIN, MO, NY, P, US); near Cobán, Standley 69218 (F, NY); region of Chelac, northeast of Carcha, Standley 70400 (F); Cobán, von Türckheim 385 (BM, GH, K, MICH, NY, P, US); Cobán, von Türckheim II 1637 (BM, C, F, G, GH, MICH, MO, NY, UC, US). Dept. Baja Verapaz: mountainside north of divide north of Santa Rosa, Standley 69925 (F, NY). Dept. Chimaltenango: Volcano Chimaltenango, Kellerman 6117 (F); Volcán de Fuego, Salvin & Godman s.n. (K); Chichavac, Skutch 331 (DS, MICH, NY, US); region of Santa Elena, Cerro de Tecpán, Standley 61051 (F, GH, NY); barranco do la Sierra, southeast of Patzún, Standley 61674 (F). Dept. El Progresso: between Calera and summit of Volcán Siglo, Steyermark 43091 (F, GH); hills north of Finca Piamonte, between Finca Piamonte and summit of Volcán Santa Luisa, Steyermark 43565 (F). Dept. Guatemala: San Rafael, Holway 46 (GH); Volcán de Pacaya, above Las Calderas, Standley 58427 (F); hills south of Mixco, Williams & Molina 11769 (F). Dept. Huehuetenango: along road to Huehuetenango, 7 miles south of San Juan Ixcoy, Municipio of San Juan Ixcoy, Breedlove 8516 (DS, F, MICH); between San

Martin and Todos Santos, Nelson 3617 (US); near Chiantla, along the river and east of town, Standley 82495 (F). Dept. Quezaltenango: Palmar, Skutch 1444 (GH); slopes of Volcán de Santa Maria, above Palojunoj, Standley 67546 (F); mountains above San Juan Ostuncalco, on road to Palestina, Standley 85250 (F, US); mountains about 4 km north of Olintepeque, Williams, Molina & Williams 22866 (GH, NY). Dept. Quiché: no specific location, Aguilar 1198 (F). Dept. Sacatepéquez: Volcán de Agua, Kellerman 7423 (F); slopes of Volcán de Agua, north of Santa María de Jesús, Standley 59376 (F, NY). Dept. San Marcos: above Río Tacaná, near San Antonio, Standley 66114 (F, GH); upper south-facing slopes of Volcán Tajumulco, between Las Canojas and top of ridge, 7 miles from San Sebastían, Steyermark 35885 (F); about 6 km (airline) north of San Marcos, Williams, Molina & Williams 25866 (UC); outer slopes of Tajumulco Volcano, about 8-10 km west of San Marcos, Williams, Molina, Williams, Gibson & Laskowski 26773 (BM, GH); road to Tajumulco Volcano, near San Andrés, Williams Molina, Williams, Gibson & Laskowski 27051 (NY). Dept. Solola: Volcán Santa Clara, Steyermark 46893 (F). Dept. Suchitepéquez: south side of cinder cone of Volcán Atitlán, Skutch 2134 (F, GH, US). Dept. Totonicapán: about 8-10 km (airline) south of Totonicapán, Williams, Molina & Williams 22923 (GH, NY). Dept. Zacapa: along Río Repollal to summit of mountain, Steyermark 42550 (F, US). HONDURAS: Dept. Morazán: Mt. Uyuca, Williams, Molina & Merrill 15592 (F, GH); drainage of the Rio Yeguare, Williams & Molina 17170 (G, GH); Cerro de Uyuca, along trail from Las Flores to La Labranza, Standley 25911 (F). MEXICO: State of Chiapas: along the road just above Tenejapa Center, Municipio of Tenejapa, Breedlove 6893 (DS, F, MICH); Titotole, Linden 426 (G, P); Mt. Ovando, Escuintla, Matuda 16251 (MO, US); Paraje Matsab, Municipio of Tenejapa, Ton 509 (DS, MSC, NY, WIS); Paraje of Matsab, Municipio of Tenejapa, Ton 1270 (DS, MICH). State of Jalisco: northern slopes of Nevado de Colima, above the sawmill called Piedra Ancha and just east of the first great canyon west of the sawmill site, McVaugh 11691 (MICH); stream bed, Arroyo del Notoguio, San Sebastian, Mexia 1670 (A, BM, DS, F, G, GH, MICH, MIN, MO, NY, UC, US); cañons between Mascota and San Sebastián, Nelson 4055 (GH). State of Mexico: Mt. Ixtaccihuatl, Deam s.n. (GH); Mesón Viejo, Temascaltepec, Hinton 3266 (F, GH, K, MO, MICH, NY); Cumbre-Gavia locality, Temascaltepec, Hinton 8836 (GH, K, MICH, NY, US); Salto de Agua, Purpus 1500 (BM, F, GH, MO, NO, POM, UC, US). State of Michoacan: 10 miles north of west of Ciudad Hidalgo and a few miles north of village of San Pedro Aguaro, McVaugh & Wilbur 9932 (MICH, US). State of Oaxaca: Sta. Inés del Monte, Zimatlán, Conzatti 1330 (GH); Sierra de San Felipe del Agua, Jackson 1027 (B, BM, C, DS, F, GH, K, MICH, MIN, MO, MSC, NY, P, POM, TEX, UC, US, WIS); Barranca del Ranchito, Petlacala, Mexia 9092a (F, GH, NY, UC, US); Sierra de San Felipe, Pringle 6051 (BM, GH, K, MICH, MIN, MO, MSC, NY, P, US); Sierra de San Felipe, Smith 262 (F, MO, NY, US); Sierra de San Felipe, Smith 306 (BM, NY); El Punto, 28 km northeast of Oaxaca, along the

road to Ixtlán de Juarez, Rzedowski 19236 (DS, MICH, TEX). State of Puebla: woodlands near Honey Station, Pringle 15008 (GH, MICH, MIN, MSC). State of San Luis Potosi: d'Aoust 278 (P). State of Vera Cruz: Vera Cruz, Sartorius s.n., P56170 (P). NICARAGUA: Dept. Jinotega: San Rafael del Norte, Miller & Griscom 24 (US); San Rafael del Norte, Miller & Griscom 86 (US).

9. ARCHIBACCHARIS CALONEURA Blake, Proc. Biol. Soc. Washington 55: 117-118. 1942. Type: MEXICO: State of Oaxaca: lower slopes, Mt. Zempoaltepetl, 19-27 February 1937, Camp 2701 (NY!; photo. MIN!; photo and fragments, US!).

Erect shrubs; ca. 15-25 dm tall; the subterranean parts and the bases not seen. Stems straight or nearly so, terete or subterete, 1.5-4.5 mm in diam. above, the internodes 1.0-3.0 cm long above, somewhat shiny, brown or dark-purple, glabrescent above with a few hispidulous and puberulous hairs on the branches and branchlets. Leaves with petioles 3.5-10.0 mm long, sparsely hispidulous; blades mostly oblong-ovate but sometimes elliptical, 3.5-8.5 cm long, 2.0-3.5 cm wide, pergamentaceous, cuneate, attenuate or barely obtuse at bases, long or short-acuminate and straight or falcate at apices, margins usually serrate or serrulate nearly to the bases but sometimes merely denticulate, sparsely hispidulous, the upper surfaces dark-green, somewhat shiny, subglabrous with a few hirtellous hairs, the lower surfaces dark-green but lighter than the upper surfaces, shinier than the upper surfaces, essentially glabrous. Panicles convex on antrorsely hispidulous peduncles. Pistillate Heads: 5.0-6.0 mm high, 4.0-4.5 mm wide, phyllaries 5-6 seriate, acute or obtuse, the outer ovate or triangular-ovate and glabrous, the inner linear-lanceolate and glabrous; filiform ray flowers 20-24, pappus 3.4-4.0 mm long, white, corollas 2.0-2.7 mm long, white, hirtellous, the hairs denser near the apices which they may exceed, the ligules erect, obscure, 0.1-0.2 mm long, achenes 1.2-2.0 mm long, 2-3 nerved, somewhat shiny and hispidulous; disk flowers 2-4, pappus 3.7-4.2 mm long, corollas 3.8-4.5 mm long, white, anthers sterile, achenes abortive, inane but sometimes apparently fertile or reduced to small knobs; abnormal intermediate flowers sometimes present. Staminate Heads: 5.0-6.0 mm high, 4.0-6.0 mm wide, phyllaries 5-6 seriate; disk flowers 24-36, white, pappus 3.0-4.2 mm long, white, irregular, composed of basally contorted and connate mixed groupings of regular, very slender barbellate pappus bristles and papillose structures which are ligulate, linear-lanceolate or attenuate to long slender or obtuse apices, the papillose structures usually covered with minute glandular structures, tubes 1.5-2.4 mm long, puberulous above, limb 1.9-2.9 mm long, puberulous, lobes lance-oblong, 1.6-2.1 mm long, the dorsal surfaces obscurely puberulous, style branches linear, acute achenes abortive, completely reduced to small, glabrous knobs.

Chromosome number: n = 9 (recorded on Breedlove 7798 as represented in the University of Michigan Herbarium).

Pollen diameters (microns): polar, 22.2-24.4; equatorial,

24.6-28.9. Breedlove 7798; Camp 2698.

Floral illustrations: Fig. 14.

The glabrous features of A. caloneura perhaps relate it to A. asperifolia and A. androgyna. The most recent collection of this species, Breedlove 7798 (MICH), a staminate specimen from Chiapas, was distributed as A. androgyna. The irregular pappus of the disk flowers found on the staminate heads make this species unique among all Archibaccharis taxa.

A new collection site was established in Oaxaca for A. caloneura with the discovery that Jurgenson 372, on loan from Kew Royal Botanic Gardens, belonged to this taxon. That particular specimen was cited long ago as being Conyza asperifolia (Benth. & Hook., 1881, p. 126).

Abnormal intermediate flowers were found on the pistillate heads of Jurgenson 372.

From Chiapas and Oaxaca, Mexico (Fig. 16). This erect shrub was reported as being collected on steep, moist slopes and in high, wooded areas, 2800-2900 m ele.

MEXICO: State of Chiapas: northeast slope of Zontehuitz near the summit, Municipio of Chamula, Breedlove 7798 (MICH). State of Oaxaca: middle slopes, Mt. Zempoaltepetl, Camp 2698 (NY); Sierra San Pedro Nolasco &c., Jurgenson 372 (K).

10. ARCHIBACCHARIS ANDROGYNA (T. S. Brandeg.) Blake, Contr. U. S. Nat. Herb. 23: 1509. 1926. Baccharis androgyna T. S. Brandeg., Univ. Calif. Publ. Bot. 6: 77. 1914. Hemibaccharis androgyna (T. S. Brandeg.) Blake, Contr. U. S. Nat. Herb. 20: 552. 1924. Type: MEXICO: State of Chiapas: Cerro del Boquerón, September 1913, Purpus 6666 (UC!; photo. MIN!; isotypes: A! BM! F! GH! MO! NY! US!).

Erect shrubs; ca. 6-24 dm tall; above-ground parts glabrate with any pubescence light-colored except in one form with a fine, black glandular pubescence on the upper portions of the stems, phyllaries and floral organs; roots fibrous. Stems essentially straight, terete, shiny, the bases 1.6 cm or less in diam., graduating to 2.0-5.0 mm in diam. above, the internodes 10.0-33.0 mm long, green, brown or reddish-brown, glabrous. Leaves with short petioles, 1.0-3.0 mm long, glabrous; blades narrowly lanceolate, 5.0-12.0 cm long, 0.7-2.5 cm wide, thinly chartaceous, cuneate or narrowly obtuse at bases, gradually long-acuminate and often falcate at apices, margins distally serrulate, glabrate, the upper surfaces dark-green but often colored with red, shiny, glabrate, the lower surfaces dark-green but lighter than the upper surfaces, shiny, glabrate. Panicles convex, arranged on glabrous peduncles. Heads: 3.4-5.0 mm high, 3.2-4.0 mm wide, phyllaries 4-5 seriate, acute, the outer triangular, oblong or less often ovate and glabrous, the inner linear or linear-lanceolate and glabrous; filiform ray flowers 17-30, pappus 1.8-3.4 mm long, white, corollas 1.7-3.0 mm long, white, puberulous from near the bases to just below the ligules or on the lower two-thirds if the ligules are

absent, the ligules erect when present, 0.5-0.9 mm long, achenes 0.7-1.4 mm long, 2-3 nerved, somewhat shiny and hispidulous; disk flowers 1-15, white, pappus 2.4-3.6 mm long, white, corollas 3.2-4.8 mm long, the tubes puberulous above, the throats very short, lobes oblong, 1.1-1.7 mm long, glabrous, anthers functional at least in some populations, perhaps not in others, style branches oblong or subclavellate, acute, achenes abortive, inane and reduced or completely reduced to small knobs.

Chromosome number: $n = 9$ (Jackson, 1969), Fig. 1.

Pollen diameters (microns): polar, 16.7-22.0; equatorial, 17.8-24.4; Jackson 1034, Ton 706.

Floral illustrations: Fig. 14.

Vernacular names: "Copalilla" in department Huehuetenango, Guatemala.

A. androgyna may be closely related to A. asperifolia and A. caloneura.

Blake, (1924, p. 552) after study of one specimen from the type collection, regarded the species as polygamodioecious and noted "the staminate plant is unknown." All heads on the the type collection were heterogamous, appearing like the usual Archibaccharis pistillate head. The anther sacs of the disk flowers seem to be sterile.

A thorough search by the author through a population of A. androgyna near Navenchauc, Chiapas, Mexico in late December, 1968 revealed no "staminate" plants. Rather, all the plants appeared to be completely capable of the monoecious condition in that all heads contained both filiform ray flowers with fertile achenes and disk flowers bearing functional anthers and abortive achenes. The disk flowers in the heads varied in number from few to many, even when heads on the same plant were compared. Attempts to identify staminate and pistillate plants failed. Chromosome counts were obtained from the anther sacs of the disk flowers.

During the dissection of Jackson 1034 some abnormal flowers were found. Seven lobes were counted on one disk flower. Another flower appeared to be partly disk flower and partly filiform ray flower. Abnormal intermediate flowers were also found during the dissection of Steyermark 36214 from department San Marcos, Guatemala.

The fact that A. androgyna appears to at least sometimes be functionally monoecious further justifies its retention in the genus Archibaccharis. The flowers do show some evolutionary loss and the stems are woody perennials, a habit not usually associated with the genus Conyza, the only other genus to which this species could reasonably be referred.

Steyermark 51922 from Huehuetenango, Guatemala appears to be a local form of this species. The specimens were in fruit and nearly all floral material had been lost. In this form, a thin, black, apparently glandular pubescence was found on the upper branches, peduncles, dorsal and ventral phyllary surfaces, ray and disk corollas, style branches and on the fertile achenes where it was intermixed with the hispidulous hairs typical of the species. Steyermark had made a note on the sheet, "crushed leaves with the

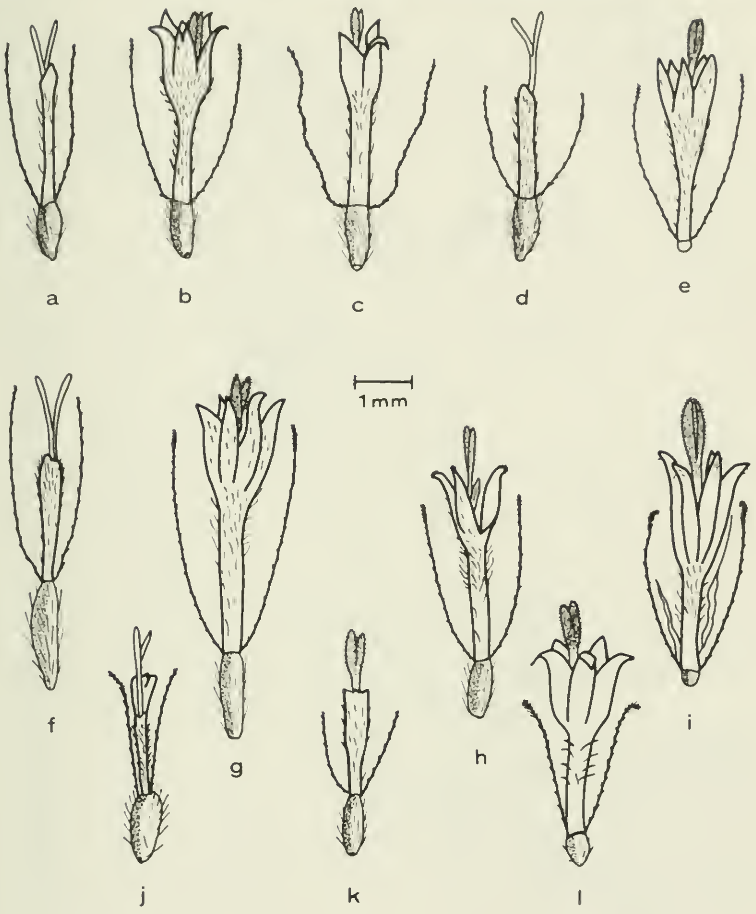

Fig. 14. Floral illustrations of Archibaccharis asperifolia, A. caloneura and A. androgyna. A. asperifolia: (a, b) pistillate heads: (Jackson 1027): (a) filiform flower, (b) disk flower; (c, d, e) staminate heads: (c) abnormal intermediate flower (Hinton 3266); (d) filiform flower (Pringle 15008); (e) disk flower (Jackson 1027). A. caloneura: (f, g, h) pistillate heads (Camp 2701): (f) filiform flower, (g) disk flower, (h) abnormal intermediate flower; staminate heads: (i) disk flower (Camp 2698). A. androgyna: (j) filiform flower (Jackson 1034), (k) abnormal intermediate flower (Steyermark 36214), (l) disk flower (Jackson 1034). Disk flowers are shown without anthers.

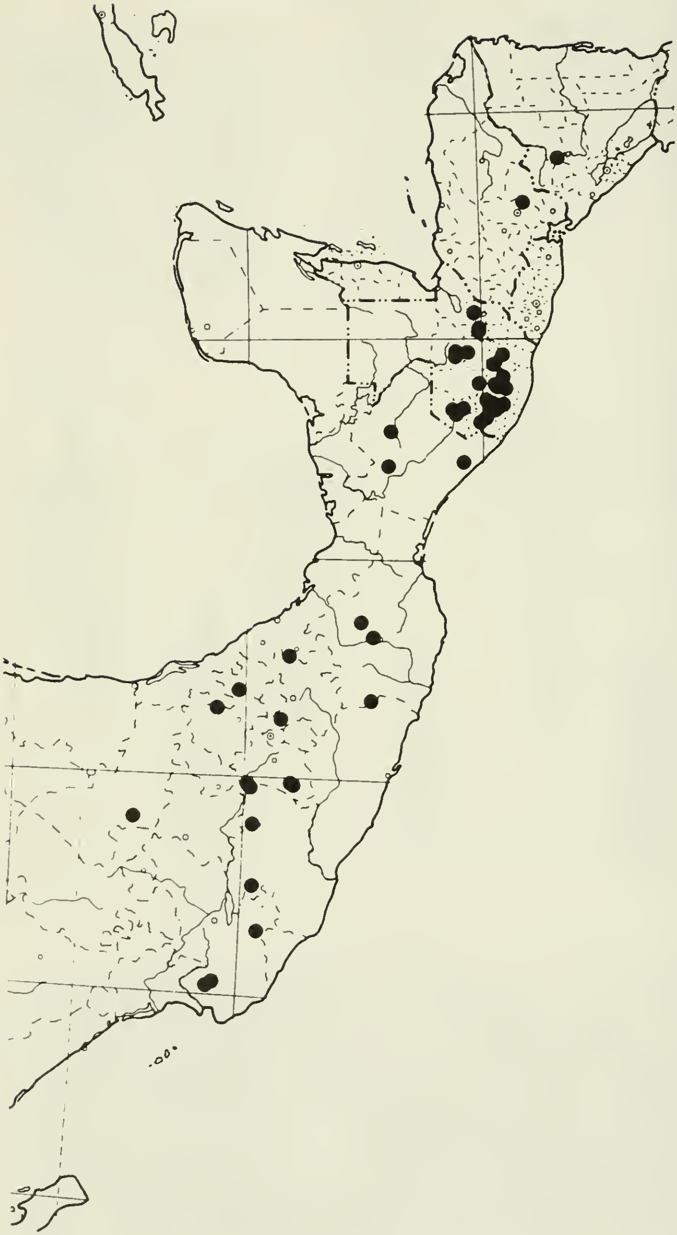

Fig. 15. Distribution of Archibaccharis asperifolia in Mexico and Central America.

Fig. 16. Distribution of species of Archibaccharis in Mexico and Guatemala. Circle, A. androgyna. Triangle, A. caloneura.

odor of dill." This characteristic was verified by the author when the Navenchauc population was studied.

From Chiapas, Mexico as well as Huehuetenango and San Marcos, Guatemala (Fig 16). This perennial shrub grows in moist woods and along shaded, moist cliffs, 700-2812 m ele.

GUATEMALA: Dept. Huehuetenango: above Macx, between Todos Santos and San Martín, Sierra de los Cuchumantanes, Steyermark 51922 (F, US); along quebrada Canjulá, between Sibinal and Canjulá, Volcán Tacaná, Steyermark 35976 (F); between La Vega ridge along Río Vega and northeast slopes of Volcán Tacaná, to 3 miles from Guatemala-Mexico boundary in vicinity of San Rafael, Steyermark 36170 (F); same location as preceding, Steyermark 36214 (F, GH). MEXICO: State of Chiapas: on moist, steep slope along Mexican highway #190, 2 km west of Navenchauc, Breedlove 7988 (F, MICH); steep, moist, rocky hillside, ca. 1 km west of Navenchauc, along Mexican highway #190, Jackson 1034 (A, B, BM, C, DS, F, G, GH, K, MICH, MIN, MO, MSC, NY, P, POM, TEX, UC, US, WIS); Municipio of Zinacantán, northwest side of Cerro Huitepec, Laughlin 511 (DS, MSC, NY, WIS); Piñuela, Mount Ovando, Matuda 5004 (F, UC); Cerro del Boquerón, Purpus 6687 in part (NY); Municipio of Tenejapa, Steep slope in the Paraje Matsab, Ton 706 (DS, MSC, NY, WIS).

11. ARCHIBACCHARIS SESCENTICEPS Blake, Contr. U. S. Nat. Herb. 23: 1509. 1926. Hemibaccharis sescenticeps Blake, Contr. U. S. Nat. Herb. 20: 552. 1924. Type: MEXICO: State of Mexico: in moist, open woods and along creeks, Mt. Ixtaccihuatl, 2135-2440 m ele., November 1905, Purpus 1501 (US!; photo. MIN!; isotypes: BM! C! DS! F! GH! MO! POM! UC!).

Erect shrubs; ca. 10-50 dm tall; roots fibrous. Stems straight below, usually obscurely fractiflex above, usually angled, glaucescent, the bases 3.0-20.0 mm in diam., graduating to 2.0-7.0 mm above, stout, the internodes 1.5-5.5 cm long, dull, purple, gray-purple or green-brown, glabrous below, becoming thinly arachnose then whitish or gray arachnose-tomentulose above. Leaves with usually long petioles, 5.0-35.0 mm long, puberulous with some arachnose hairs below, arachnose above; blades usually oblong-ovate, ovate or rarely elliptical, 6.0-14.0 cm long, 2.0-6.5 cm wide, usually chartaceous but sometimes membranaceous, obtuse or cuneate at bases, acuminate at apices, margins distally serrate, glabrous or hispidulous, upper surfaces dark-green, dull, hispidulous or sometimes glabrous, lower surfaces lighter green, dull, usually glabrous but sometimes subglabrous with puberulous and arachnose hairs. Panicles pyramidal on arachnose-tomentulose peduncles. Pistillate Heads: 4.0-6.0 mm high, 2.5-4.0 mm wide, phyllaries ca. 4-seriate, acute, sometimes acuminate, linear or linear-lanceolate, the outer ones sometimes with scattered puberulous hairs, rarely arachnose; filiform ray flowers 21-46, pappus 2.5-3.2 mm long, white, corollas 1.8-2.5 mm long, creamy-white, puberulous above, the ligules erect, short, 0.1-1.4 mm long,

glabrous, achenes 0.8-1.3 mm long, 2-3 nerved, somewhat shiny and hispidulous; disk flowers 1-3, pappus 2.5-3.2 mm long, corollas 2.8-3.6 mm long, creamy-white, anthers sterile, achenes inane or apparently sometimes fertile; abnormal intermediate flowers sometimes present. Staminate Heads: 4.0-5.0 mm high, 2.5-3.5 mm wide, phyllaries ca. 4-seriate; disk flowers 17-29, creamy-white, pappus 2.1-3.0 mm long, white, tubes 1.3-2.0 mm long, puberulous above, limb 1.2-2.1 mm long, puberulous, lobes usually oblong or merely acute but sometimes linear, 0.7-1.3 mm long, the dorsal surfaces glabrous or with a few puberulous hairs, style branches oblong or linear, acute, achenes abortive, inane or reduced to small knobs or sometimes apparently fertile.

Chromosome number: n = 9 (Jackson, 1969), Fig. 1.

Pollen diameters (microns): polar, 17.8-23.3; equatorial, 18.9-25.0; Jackson 1047, Purpus 1501.

Floral illustrations: Fig. 17.

Archibaccharis sescenticeps is distinguished by its angled, purple, glabrescent, stout, arachnose-tomentulose stems. Examination of wood accumulation in older stems clearly show the perennial nature of the species. The floral morphology appears to differ little from that of A. asperifolia, a more widespread species with which it is partially sympatric and whose stems have not been shown to be perennial.

The specimens cited by Blake (1924, p. 552) when he first described A. sescenticeps have been seen by the author with the exception of Nelson 4055 (US). As represented in the Gray Herbarium, the specimen of that collection lacks arachnose-tomentulose hairs on essentially glabrous, terete stems and has been cited in this paper as A. asperifolia.

Abnormal intermediate flowers were found on the pistillate heads of some specimens.

From Mexico, D. F. and the states of Guerrero, Hidalgo, Mexico and Michoacan (Fig. 18). This perennial shrub has been collected in oak woods, on granitic slopes, pine forests, pine-covered slopes, moist barrancas and slopes, 2100-3500 m ele.

MEXICO: Federal District: Contadero, Lyonnet 375 (BM, GH, K, MO, NY, US). State of Guerrero: at and just below summit of Cerro Alquitrán, 17-18 km by road west of Mexican Highway #95 and Mazatlán, Anderson & Laskowski 4411 (MICH); about 10 km west of Chilpancingo, Feddema 2759 (MICH); Teotepec locality, Galeana District, Hinton 11138 (G, K, MICH, P, US); Teotepec locality, Galeana District, Hinton 14784 (F, GH, MO, US); top of Sierra Madre near Chilpancingo, Nelson 2203 (US); Carrizal, 9 km west of Camotla, Municipio of Chichihualco, Rzedowski 18014 (MICH, MSC, WIS); same location as the preceding, Rzedowski 18015 (DS, MICH, MSC, WIS); El Asoleadero, 15 km west of Camotla, Municipio of Chichihualco, Rzedowski 18079 (DS, MICH, MSC, WIS); more or less 2 km northeast of Campamento El Gallo, western spur of Cerro Teotepec, Rzedowski & McVaugh 194 (MICH, MSC). State of Hidalgo: near Real del Monte above Pachuca, Sharp 441078 (NY). State of Mexico, Desierto Viejo, Berlandier 1167 (BM); San Nicolás near

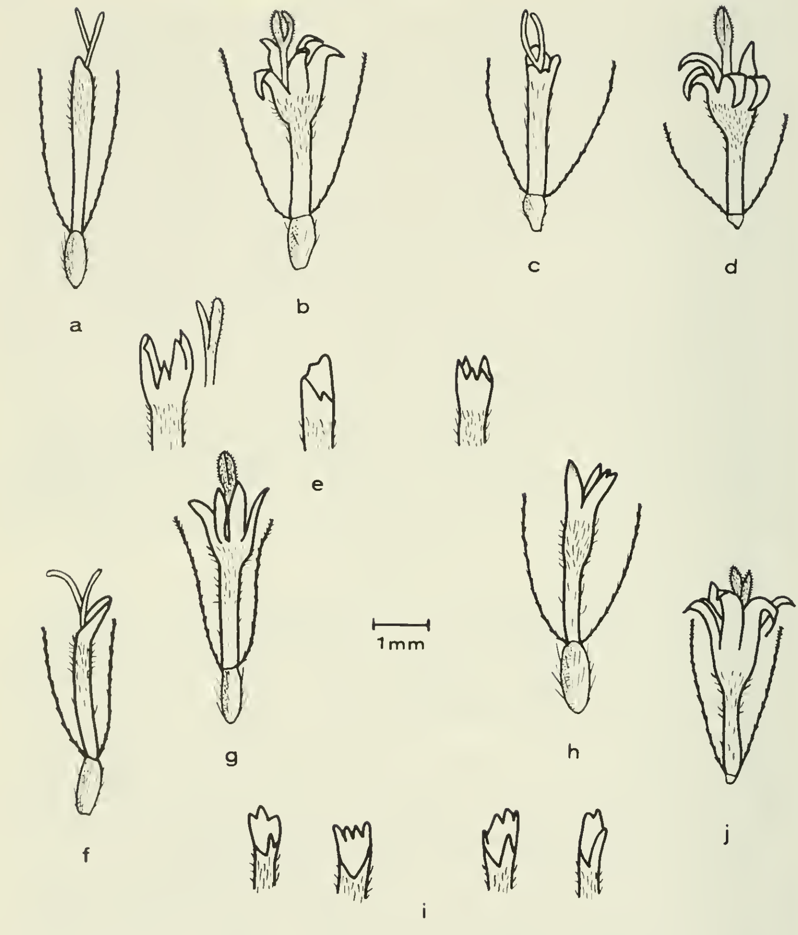

Fig. 17. Floral illustrations of Archibaccharis sescenticeps and A. serratifolia. A. sescenticeps: (all from Jackson 1047): (a, b, c) pistillate heads: (a) filiform flower, (b) disk flower, (c) abnormal intermediate flower; (d, e) staminate heads (d) disk flower, (e) apices of abnormal intermediate flowers. A. serratifolia: (f, g) pistillate heads (Jackson 1048): (f) filiform flower, (g) disk flower, (h) abnormal intermediate flower (Jackson 1037), (i) apices of abnormal intermediate flowers, (Jackson 1048); staminate heads: (j) disk flower (Pringle 11288). Disk flowers are shown without anthers.

Fig. 18. Distribution of Archibaccharis sescenticeps in Mexico.

Mexico, Bourgeau 970 in part (C, G, GH, K, P, US); collines near Maromas, Valley of Mexico, Bourgeau 1092 (P); south Mexico, San Nicolás, Valley of Mexico, Bourgeau 1228 (C, GH, K, NY, P, US); Amecameca, Goodding 2159 (UC); Comunidad locality, District of Temascaltepec, Hinton 2461 (GH, UC, US); 18 miles west of Mexico City on Highway 15, Hunsaker II (TEX); Mesón Viejo, along Mexican Highway #130, Jackson 1047 (B, BM, C, DS, F, G, GH, K, MICH, MIN, MO, MSC, NY, P, TEX, UC, US); San Rafael, Municipio of Tlalmanalco, Jiménez 199 (MSC); Contreras, Matuda 18622 (NY); around Amecameca, Matuda 25740 (NY); San Rafael, foothill east of Ixtaccihuatl, Matuda 27568 (NY); 3 km east of San Rafael, municipio of Tlalmanalco, Rzedowski 19347 (MICH, MSC, WIS); Propae las Maromas, Woronow & Juzepczuk 1049 (US). State of Michoacan: ca. 18 miles south of Pátzcuaro, King & Soderstrom 5210 (MICH, NY, TEX, UC).

12. ARCHIBACCHARIS SERRATIFOLIA (H.B.K.) Blake, Contr. U. S. Nat. Herb. 26: 236. 1930. Baccharis serratifolia H.B.K., Nov. Gen. & Sp. 4: 59. 1820. Type: MEXICO: State of Guanajuato: on steep slopes between Santa Rosa and Los Ioares, 2600 m ele., September, no year given, H.B.K. 31 (P!).

Baccharis mucronata H.B.K., Nov. Gen. & Sp. 4: 60. 1820. Hemibaccharis mucronata (H.B.K.) Blake, Contr. U. S. Nat. Herb. 20: 550-551. 1924. Archibaccharis mucronata (H.B.K.) Blake, Contr. U. S. Nat. Herb. 23: 1508. 1926. Type: MEXICO: State of Guanajuato: growing with H.B.K. no. 31, H.B.K. 32 (P!; photo., MSC!).

Baccharis micrantha H.B.K., Nov. Gen. & Sp. 4: 60. 1820. Type: MEXICO: State of Guanajuato: near Guanajuato, ca. 2000 m ele., September, no year given, H.B.K. 33 (P!).

Pluchea floribunda Hemsl., Diag. Pl. Mex. 2: 32-33. 1879. Type: MEXICO: State of Vera Cruz: Mirador, Linden 1171 (Lectotype: as part of a mixed sheet including Galeotti 2308, also A. serratifolia, K!; photo., MIN!; isolectotypes: G! P!).

Diplostephium paniculatum Donnell Smith, Bot. Gaz. 23: 8-9. 1897. Hemibaccharis mucronata paniculata (Donn. Smith) Blake, Contr. U. S. Nat. Herb. 20: 551. 1924. Archibaccharis mucronata paniculata (Donn. Smith) Blake, Contr. U. S. Nat. Herb. 23: 1508-1509. 1926. Archibaccharis mucronata var. paniculata (Donn. Smith) Blake, Amer. Journ. Bot. 15: 64. 1928. Archibaccharis serratifolia var. paniculata (J. D. Sm.) Blake, Journ. Washington Acad. Sci. 21: 328. 1931. Type: GUATEMALA: Dept. Huehuetenango: between San Martín and Todos Santos, 2180-2656 m ele., December 1895, Nelson 3629 (US!; photo., MIN!; isotype: GH!).

Erect or rarely arching shrubs; 5-30 dm tall; above-ground parts with variable pubescence which is whitish, canescent, cinereous or sometimes sordid; roots fibrous, the plants sometimes rhizomatous. Stems straight below, straight or obscurely fractiflex above, usually angled but sometimes terete, the bases 1.5-10.0 mm in diam., graduating to 1.0-4.0 mm above, the internodes 1.0-7.0

cm long, dull, reddish-brown, brown, gray-brown, dark-purple, reddish-purple or reddish, glabrescent below, densely or sparsely tomentose or tomentulose but sometimes with shorter, somewhat harsh pubescence, these hairs always present for a considerable distance from the stem apices. Leaves with petioles, 0.7-15.0 mm long, rarely lacking, tomentose or puberulous; blades variable, ovate, lance-ovate, lanceolate, oblong-ovate or elliptical, 4.5-17.0 cm long, 1.5-5.0(-7.5) cm wide, chartaceous but often thickly so, usually abruptly cuneate at bases, rarely attenuate or obtuse, long or short-acuminate or acute at apices, margins distally serrate, serrulate or merely denticulate, hispidulous or with less harsh hirtellous or pilosulous hairs, upper surfaces dark-green, somewhat glossy or dull, hirtellous or hispidulous, sometimes pilosulous, often with a mixture of hair types which vary in length, density and texture, lower surfaces lighter green, somewhat glossy or dull, densely tomentose, tomentulose, hispidulous, pilosulous, hirtellous or with mixtures of these hairs which may vary greatly in length, density and texture. Panicles pyramidal on tomentose, tomentulose, pilosulous or sometimes hirtellous peduncles. Pistillate heads: 4.0-5.0 mm high, 2.5-3.5 mm wide, phyllaries 4-5 seriate, acute or obtuse, linear or linear-lanceolate, the outer ones sometimes sparsely puberulous, the inner ones glabrous; filiform ray flowers 18-40, pappus 1.7-3.0 mm long, white, corollas 1.8-2.8 mm long, creamy-white or white, puberulous near the apices, the ligules erect or obliquely reflexed, 0.3-0.8 mm long, glabrous, achenes 0.7-1.4 mm long, 2-nerved, somewhat shiny, hispidulous or subglabrous; disk flowers 1-6, pappus 2.2-3.2 mm long, corollas 2.4-3.5 mm long, creamy-white or white, anthers sterile, achenes inane or apparently sometimes fertile; abnormal intermediate flowers sometimes present. Staminate Heads: 4.0-5.0 mm high, 2.5-4.0 mm wide, phyllaries 4-5 seriate; disk flowers 16-45, creamy white or white, pappus 2.0-3.0 mm long, white, tubes 1.0-1.8 mm long, puberulous above, limb 1.2-2.4 mm long, usually puberulous, lobes triangular, oblong or rarely linear, 0.7-1.3 mm long, sparsely puberulous or glabrous, style branches oblong or barely lanceolate, short-acuminate or acute, achenes abortive, inane or reduced to small knobs.

Chromosome number: n = 9 (Jackson, 1969), Fig. 1.

Pollen diameters (microns): polar, 16.0-19.4; equatorial, 16.7-21.0; Breedlove 7579, Hinton 8663, Jackson 1037, Jackson 1048.

Floral illustrations: Fig. 17.

Vernacular names: "Hierba del carbonero" was the name reported by Blake (1926, p. 1508) as applied in the Valley of Mexico. Further, "a decoction of the flowers is reported to be used as a remedy for catarrh." My study of the collections of this species did not reveal the source of Blake's information.

Archibaccharis serratifolia is a species which is extremely variable in its vegetative characteristics. The species may be distinguished by its dull stem which is noticeably pubescent with usually light-colored hairs for a considerable distance below the

inflorescences.

The present treatment of this species includes the name A. serratifolia var. paniculata as a synonym. Blake's (1924, p. 546) separation of two varieties of this species was justified by the amount of pubescence on stems and leaves as well as the harshness of the upper leaf surfaces. He regarded var. paniculata as a more "southern form" (Blake, 1924, p. 551). After my investigations of three populations in Mexico and Guatemala, little correlation was found between densely tomentose plants and upper leaf surfaces which were soft. In general, the older, lower leaves tend to become harsher, apparently with age. Herbarium studies also supported these observations. Plants from Mexico and Guatemala were often equally tomentose. Although extreme forms of this species appear quite distinct, no technical differences were found in floral structures. On the whole, it seems best to treat all specimens as belonging to a single species which is extremely variable in form and amount of pubescence.

Some populations of this species showed abnormal intermediate flowers on the pistillate heads.

From Chihuahua and Nuevo León, Mexico, extending to southern Guatemala (Fig. 20). The habitat of this perennial shrub has been described as on brushy slopes, in moist thickets, in pine, oak and fir forests, on dry exposures and rocky slopes, 384-2850 m ele.

GUATEMALA: Dept. Chimaltenango: San Martín, Chite Verde, Johnston 1767 (F); plains near Tecpán, above Tecpán, Skutch 759 (A, DS, MICH, US); Barranco de La Sierra, southeast of Patzúm, Standley 61606 (F). Dept. Escuintla: no location, Aguilar 1759 (F); Morillo, Morales 885 (US). Dept. Guatemala: along F.D.R. Highway 21 km northwest of Guatemala City, Molina, Burger & Wallenta 15984 (F). Dept. Huehuetenango: no location, Skutch 1643 (A, F, NY, US); mountains west of Aguacatán, on the road to Huehuetenango, Standley 81324 (F); along road 13 km west of Huehuetenango, near Puente de Xinaxo, Standley 81483 (F). Dept. Jalapa: Volcán Jumay, north of Jalapa, Steyermark 32426 (F); between Jalapa and Montaña Miramundo, Steyermark 32876 (F). Dept. Quezaltenango: about 4 km north of Olintepeque, Williams, Molina & Williams 22860 (GH, NY). Dept. Quiché: pine forest of Pascual Abaj, west of Chichicastenango, Molina, Burger & Wallenta 16277 (F). Dept. Santa Rosa: Casillas, Heyde & Lux 4251 (F, GH, K). Dept. Sacatepéquez: Cerro de la Cruz, above Antigua, Jackson 1037 (F, G, GH, K, MIN, NY, P, US); slopes of Volcán de Agua, south of Santa María de Jesús, Standley 59496 (F, NY); Finca El Hato, northeast of Antigua, Standley 61232 (F, MICH); near Antigua, Standley 61752 (F, MICH); Cerro de la Cruz, above Antigua, Standley 63327 (F, GH). MEXICO: State of Chiapas: along road to Pinola, 2 km southwest of Aguacatenango, Municipio of Carranza, Breedlove 7922 (F, MICH); 3 miles south of Aguacatenango along road to Pinola Las Rosas, Municipio of Venustiano Carranza, Breedlove & Raven 13136 (DS, MICH); on trail from Zinacantán

Center to Ixtapa near Paraje Vo'bits, Municipio of Zinacantán, Laughlin 2405 (MICH); Mt. Pasitar, Matuda 0744 (MICH, MO). State of Chihuahua: Quicorichi, Río Mayo, Gentry 1999 (A, BM, F, K, MO); southwestern Chihuahua, Palmer 277 (GH, K, US); southwestern Chihuahua, Palmer 281 (BM, GH, K, NY, US). State of Durango: Espinazo, near the dedication monument, 20 miles east of the Sinaloa state line, Weber & Charette 11788 (MICH). Federal District: barranca near Santa Fe, Valley of Mexico, Bourgeau 1096 (C, G, GH, MSC, K, P, UC, US); Lomas de Mixcoac, Lyonnet 2992 (US); Angostura, Lyonnet 3417 (US); mountainside above Tlalpam, Pringle 11288 (GH, MICH, US); mountains above Eslaba, Pringle 11482 (C, F, GH, K, MO, US). State of Guanajuato: Cerro Grande, around San Diego, Municipio of Acámbaro, Rzedowski 21384 (MICH, MSC). State of Guerrero: Sierra Madre del Sur, Distrito Mina, second ridge west of Petlacala, Mexia 9053 (F, G, GH, K, MO, NY, UC); Carrizal, 9 km east of Camotla, Municipio of Chichihualco, Rzedowski 18031 (MICH, MSC, TEX); El Asoleadero, 15 km east of Camotla, Municipio of Chichihualco, Rzedowski 18059 (MICH, MSC, TEX). State of Hidalgo: Real Del Monte, El Sanate, Ehrenberg 401 (P). State of Jalisco: ca. 28 road miles west of Ayutla, and about 70 miles northwest of Autlán, Cronquist 9792 (MICH, NY, TEX, US); Sierra de Manantlán, 15-20 miles southeast of Autlán, near Aserrando El Cuartón, McVaugh 13852 (MICH); Río Blanco, Palmer 737 (GH, MO, NY, P); shaded canyons near Guadalajara, Pringle 2364 (BM, F, GH, K, MICH, MO, MSC, NY, P, UC, US); 5 km east of Rancho del Mortero, Municipio of Mezquitic, Rzedowski 17693 (MICH). State of Mexico: forest of San Nicholás, Bourgeau 969 (GH, K, P, US); Rancho San Lorenzo near town of Valle de Bravo, Dodds & Simpson 39 (MICH); Mesón Viejo, District of Temascaltepec, Hinton 2730 (BM, GH, K, US); District of Temascaltepec, Ocotepec, Hinton 2898 (BM, GH, K, MO, NY, US); 2.5 miles northeast of Temascaltepec, along Mexican Highway #130, Jackson 1048 (B, BM, C, F, G, GH, K, MICH, MIN, MO, MSC, NY, P, TEX, UC, US, WIS); Salto de Agua, Purpus 1502 (F, GH, MO, NY, UC US); Mt. Ixtaccihuatl, Purpus 1579 (F, GH, MO, NY, US); Valley of Mexico, Reiche 3 (US); Valley of Mexico, Schaffner 787 (K, P). State of Michoacan: Quinceo, vicinity of Morelia, Arsène 3241 (MICH, MO, P, US); Loma Santa María, vicinity of Morelia, Arsène 3646 (US); Cerro San Miguel, vicinity of Morelia, Arsène 5296 (MO, P, US); 5 miles north of Pátzcuaro, Cronquist 9725 (NY); Zitácuaro-Guanoro locality, Zitácuaro District, Hinton 13430 (G, K, MICH, NY, P, UC, US). State of Morelos: Sierra de Ocuila rumbo Mexicapa, Lyonnet 2857 (US). State of Nuevo León: Dulces Nombres and just east of border into Tamaulipas, Meyer & Rogers 2966 (BM, G, GH, K, MO, US). State of Oaxaca: mountain slopes near Tlaxiaco, trip into the Mixteca, Camp 2211 (NY); Sierra de San Felipe del Agua, north of Oaxaca, Jackson 1026 (B, BM, C, F, GH, K, MICH, MIN, MO, MSC, NY, P, UC, US, WIS); Sierra de Clavellinas, Smith 260 (MO, NY, UC, US). State of Puebla: barrancas near Hacienda Alamos, route to Vera Cruz, Arsène 2090 (MO, NY, US); Manzanilla, vicinity of Puebla,

Arsène & Nicolas 5491 (GH, MO, US); same location as the preceding, Nicolas s.n., P42170 (P). State of San Luis Potosi: Alvarez, Palmer 168 (BM, F, GH, MO, MSC, NY, UC); region of San Luis Potosi, Parry & Palmer 338 (BM, GH, K, MO, NY, UC); region of San Luis Potosi, Parry & Palmer 339 (BM, F, GH, K, MO, NY, P, US); Sierra de Alvarez, southeast of Calera, Rzedowski 5647 (MSC); San Luis Potosi, Schaffner 359 (BM, C, F, G, GH, MICH, NY, P, UC, US). State of Sinaloa: along route no. 40, 4 miles west of El Palmito, Powell & Edmonson 923 (MICH, TEX). State of Vera Cruz: Orizaba, Botteri 1106 (K); Orizaba, Botteri 1139 (K, P); Orizaba, Mohr 1114 (US); Orizaba, Müller 677 (P); Orizaba, Müller 1015 (NY, P); Orizaba, Schaffner 333 (GH, P). State of Zacatecas: Puerto de la Paja, 20 km to the west-southwest of Valparaiso, along the road to Huejuquilla, Rzedowski 17537 (MICH).

13. ARCHIBACCHARIS PENINSULARIS Blake, Journ. Washington Acad. Sci. 33: 267-268. 1943. Type: MEXICO: State of Baja California Sur: in small canyon in shade, rocky talus slopes under oaks, Arroyo Hondo, Sierra Giganta, ele. not given, 13 December 1938, Gentry 4120 (DS!; photo. MIN!; photo. and fragments, US!; isotypes: GH! MO! UC!).

Spreading, often pendent shrubs; 5-15 dm tall; above ground parts mostly hispidulous with whitish hairs; the subterranean parts and the bases not seen. Stems essentially straight, subterete, angled slightly by lines decurrent from the leaf bases, 1.0-4.0 mm in diam. above, the internodes 1.0-15.0 mm long, somewhat shiny, the main stems and older branches purple-brown or dark-purple, glabrescent below, thickly hispidulous above, the younger branches brown-green or green, thickly hispidulous. Leaves with petioles bearing decurrent, narrow margins which may or may not continue to the bases, 3.0-9.0 mm long, densely hispidulous below and on the margins; blades broadly elliptical or obovate, 2.0-5.0 cm long, 1.5-2.5 cm wide, chartaceous or thicker as in parchment, cuneate at bases, these continuing decurrently for varying distances on the petioles, obtuse, acute or sometimes emarginate at apices, margins distally often coarse-serrate, sometimes serrulate, hispidulous, upper surfaces dark-green, somewhat shiny, sparsely hirtellous with some hispidulous hairs or subglabrous, lower surfaces lighter green than the upper surfaces but dark, often as shiny as the upper surfaces, sparsely hispidulous. Panicles flat or convex on densely hispidulous peduncles. Pistillate Heads: ca. 5.0 mm high, 3.0 mm wide, phyllaries ca. 5-seriate, obtuse, the outer ones ovate or oblong-ovate and sparsely hirtellous on their bases, the inner ones oblong, oblong-ovate or just obovate, glabrous; filiform flowers 25-31, pappus 2.4-3.0 mm long, white, corollas 2.0-2.7 mm long, tubes white, the lobes or reduced lobes white but becoming purple or rosy at maturity, the tubes slender, puberulous above, the throats represented by a noticeably constricted, glabrous portion 0.6-0.8 mm long, the lobes nearly equally reduced and similar to

those of the disk flowers of the staminate heads, 0.4-0.6 mm long, nearly equal with little suggestion of zygomorphy, oblong or sometimes triangular, the apices thickly subglandular or with elongated setae, anthers present but completely vestigial within the tubes, style branches oblong, obtuse but sometimes short-acute, achenes 0.9-1.2 mm long, 0.4-0.5 mm wide, 2-3(-5) nerved. Staminate Heads: 5.0-5.5 mm high, 3.3-3.5 mm wide, phyllaries 4-5 seriate; disk flowers 5-20, tubes white, the lobes or reduced lobes white but becoming purple or rosy at maturity, pappus 2.5-2.8 mm long, white, tubes 1.2-1.8 mm long, glabrous except for a few nearly erect hairs near the apices, limb 1.3-2.2 mm long, puberulous, lobes linear or barely linear-lanceolate, 1.1-1.5 mm long, puberulous dorsally near the apices, style branches oblong or linear, short-acute or obtuse, achenes inane or apparently often fertile, 0.8-1.2 mm long, 2-3 nerved.

Pollen diameters (microns): polar, 16.0-20.0; equatorial, 17.8-22.8; Carter 5087, Carter 4761.

Floral illustrations: Fig. 19.

Blake (1943, p. 267) referred this plant to the genus *Archibaccharis*. The type collection, Gentry 4120, was composed solely of staminate plants with heads completely of normal disk flowers, a characteristic of the genus *Baccharis* as well as *Archibaccharis*. The nature of the habit and the thin leaves led Blake to place the plant in *Archibaccharis*.

Recent (1951-1967) collections of exceptionally fine specimens of *A. peninsularis* have been provided principally by Annetta Carter from the University of California. Through these collections, the first pistillate specimens and additional staminate specimens were made available for study.

Study of the heads of the available pistillate specimens has proven them to be different from any known taxon of *Archibaccharis*. These heads are composed completely of "intermediate" flowers. The tubes are slender as are the noticeably constricted throats which bear five reduced lobes. Vestigial anther sacs were found within the tubes and the achenes were fertile with 2-3(-5) nerves.

The disk flowers of the staminate heads contained functional anthers and apparently often fertile achenes. It does not seem impossible that some populations are composed solely of functionally staminate plants, a fact which might account for the completely staminate nature of all known sheets of the type collection. Carter & Moran 5367 (UC) from Cañada del Encinal was a collection of both pistillate and staminate plants, the achenes of the latter apparently fertile. The species appears to be subdioecious.

Because of the intermediate floral condition of the pistillate heads, number of achene nerves, apparent subdioecious nature of the species and general habit of the species, it is the author's opinion that this species should be retained in the genus *Archibaccharis* for the present.

known only from Baja California Sur in the Sierra de la Giganta

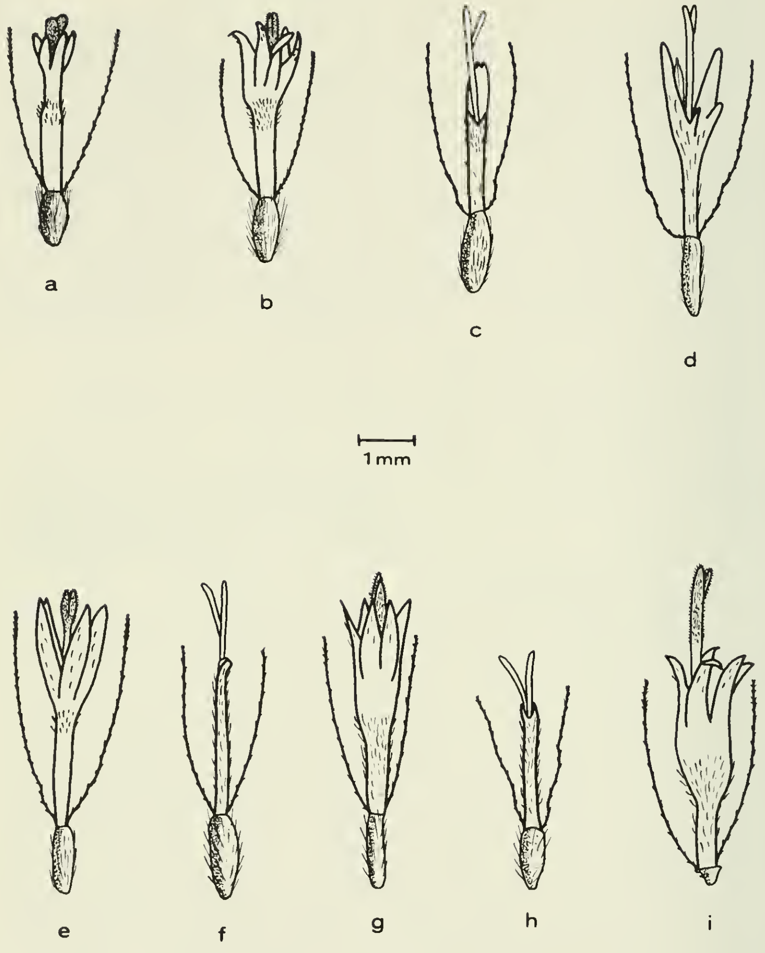

Fig. 19. Floral illustrations of Archibaccharis peninsularis, A. panamensis and A. irazuensis. A. peninsularis: pistillate heads: (a) filiform flower, vestigial stamens not shown, (Carter & Sousa 5183), (b) disk flower (Carter 5087). A. panamensis: (all from Allen 751): (c, d, e) pistillate heads: (c) filiform flower, (d) abnormal intermediate flower, (e) disk flower. A. irazuensis: (f, g) pistillate heads: (Standley & Valerio 43502): (f) filiform flower, (g) disk flower; staminate heads: (h) filiform flower (Williams & Molina 13865), (i) disk flower (Pittier 14078). Disk flowers are shown without anthers.

Fig. 20. Distribution of species of Archibaccharis in Mexico and Central America. Triangle, A. peninsularis. Circle, A. serratifolia.

region (Fig. 20). The habitat of this perennial shrub has been described mostly as on or near steep, rocky cliffs, steep slopes or on rocks, 400-111 m ele.

MEXICO: State of Baja California Sur: steep, north-facing slope, Cañada de Tripui southwest of Puerto Escondido, Sierra de la Giganta, Carter 4355 (UC); vicinity of Rancho Agua Escondido, in a canyon on the western slope of the Sierra de la Giganta a few miles from the crest, Carter 4761 (GH, MICH, UC); near base of lowest main cliffs on north-facing slope of Cerro Gabilán, south of Portezuelo de Gabilán, Carter 5087 (UC); on steep north-facing slope near crest of ridge, south of Valle de Los Enciños (south side of Cerro Giganta), Carter & Ferris 3996 (UC); Cañon del Cayuco, east base of Cerro de la Giganta, Sierra de la Giganta, Carter & Kellogg 3123 (BM, GH, MICH, UC); Cerro del Barreno, south side of Valle de Los Encinos (south side of Cerro Giganta). Carter & Moran 5334 (UC); Cañada del Encinal, south side of Valle de Los Enciños (south side of Cerro Giganta), Carter & Moran 5367 (BM, MICH, UC); steep, north-facing slopes near base of cliffs, southwest of El Aguaje, between Arroyo Hondo and Arroyo de las Palmas, northwestern slopes of Cerro Giganta, Carter & Sousa 5183 (UC).

14. ARCHIBACCHARIS PANAMENSIS Blake, Ann. Mo. Bot. Gard. 28: 472-474. 1941. Type: PANAMA: Province of Coclé, vicinity of El Valle, 100-800 m ele., 5 September 1938, Allen 751 (US!; photo., MIN! TEX!; isotype: GH!).

Erect ligneous herbs; ca. 15 dm tall; the subterranean parts and bases not seen. Stems essentially straight but perhaps obscurely fractiflex near the inflorescences, terete or sometimes slightly angled, 1.0-3.0 mm in diam. above, the internodes 1.5-4.5 cm long above, somewhat shiny, brown, pilosulous-villosulous above, the hairs sordid or brown. Leaves with short petioles, 1.0-3.0 mm long, puberulous below; blades elliptical-obovate or oblong-elliptical, 5.5-9.5 cm long, 2.0-3.0 cm wide, thinly chartaceous, cuneate at bases, short-acute or barely short acuminate at apices, margins distally denticulate, pilosulous, upper surfaces dark-green, dull, evenly puberulous with scattered subsessile glands, lower surfaces gray-green, dull, densely pilosulous with scattered subsessile glands. Panicles lax and loose on pilosulous-villosulous peduncles. Pistillate Heads: ca. 5.0 mm high, 2.5-3.0 mm wide, phyllaries ca. 4 seriate, acute or acuminate, the outer ones linear-subulate and entirely puberulous, the middle ones narrow and nearly linear, puberulous only near the apices, the inner ones narrow and nearly linear, glabrous; filiform ray flowers 18-24, pappus 3.0-3.2 mm long, white, corollas 2.5-2.8 mm long, white, densely puberulous near the apices, the ligules erect, 0.8-1.0 mm long, glabrous, achenes scarcely mature but presumably fertile, 1.5-1.6 mm long, 4-7 nerved, somewhat shiny, densely hirtellous; disk flowers 1-2, pappus ca. 3.6 mm long, corollas ca. 4.6 mm long, white, the throats nearly absent,

the expansion at that point gradual or abrupt by nearly a right-angle to the tubes, the lobes linear, ca. 1.8 mm long, sparsely puberulous on their dorsal surfaces, anthers sterile, style branches oblong or lance-oblong, acute, achenes inane. Staminate heads unknown.

Floral illustrations: Fig. 19.

Archibaccharis panamensis shares many characteristics with A. irazuensis from Costa Rica. However, the filiform corollas of A. panamensis have well-developed ligules when compared with those of A. irazuensis. The two species also differ in leaf characters. They have been collected at much different elevations.

The staminate specimen of A. panamensis is unknown. My examination of the apparently fertile achenes of the filiform ray flowers of the pistillate heads indicated 4-7 nerves. This character may tend to break down a usual distinction between Archibaccharis and Baccharis.

Abnormal intermediate flowers were found on the heads examined.

From Panama, known only by a single collection from the type locality (Fig. 21). There were no ecological notes on the collector's label other than the ele., 100-800 m.

Two specimens from the type collection were the only ones available for study.

15. ARCHIBACCHARIS IRAZUENSIS Blake, Journ. Washington Acad. Sci. 17: 60. 1927. Hemibaccharis irazuensis Blake, Contr. U. S. Nat. Herb. 20: 551. 1924. Type: COSTA RICA: Prov. San José: Laguna del Reventado, Volcán de Irazú, 2300 m ele., 1 January 1901, Pittier 14079 (US!; photo. MIN!; isotypes: F! G! GH! US!).

Erect ligneous herbs(?); ca. 10-20 dm tall; the subterranean parts and the bases not seen. Stems essentially straight but sometimes obscurely fractiflex above, terete, 1.0-4.0 mm in diam. above, the internodes 3.0-11.5 mm long above, purple or sometimes brown, somewhat shiny, glabrescent below, quite densely sordid-pilosulous above. Leaves subsessile or the petioles 2.0-7.0 mm long, sordid-pilosulous; blades lance-ovate, lance-elliptic, ovate or elliptic, 5.0-12.5 cm long, 1.5-3.5 cm wide, chartaceous, sometimes thickly so, cuneate or obtuse at bases, long-acuminate at apices, rarely subacute, margins distally serrulate or denticulate, rarely completely entire, sordid-pilosulous with some hispidulous hairs, upper surfaces dark-green, dull, sordid-pilosulous with some hispidulous hairs, lower surfaces lighter green, dull, sparsely pilosulous. Panicles convex on rather flat on sordid-brown, pilosulous peduncles. Pistillate Heads: 6.0-7.0 mm high, 3.0-5.0 mm wide, phyllaries ca. 5-seriate, acute or acuminate, the outer ones oblong-lanceolate and puberulous, the inner ones linear-lanceolate and becoming glabrous; filiform ray flowers 32-48, pappus 2.9-3.9 mm long, brown-tinged, corollas 2.4-2.8 mm long, white, puberulous nearly to the bases, the ligules erect, 0.2-0.4 (-0.8) mm long, puberulous, achenes 1.0-1.8 mm long, 2(-3) nerved;

disk flowers (0-)4-5, white, pappus 2.7-3.8 mm long, corollas (1.0-)3.6-4.0 mm long, white, anthers sterile, achenes abortive, inane or reduced to small knobs. Staminate Heads: 5.0-7.0 mm high, 4.0-5.0 mm wide, phyllaries ca. 4-5 seriate; filiform ray flowers occurring sporadically, 0-7, pappus 2.4-3.2 mm long, corollas often reduced, 1.6-2.2 mm long, white, achenes perhaps sometimes fertile; disk flowers 20-33, white, pappus 3.5-4.5 mm long, brown-tinged, tubes 1.2-1.8 mm long, puberulous, limb 2.1-3.2 mm long, puberulous, lobes oblong or triangular, 1.0-1.4 mm long, sparsely puberulous on the dorsal surfaces, style branches linear, acute, achenes abortive, inane or reduced to small knobs.

Pollen diameters (microns): polar, 16.7-21.0; equatorial, 18.9-23.3; Pittier 14078, Pittier 14079.

Floral illustrations: Fig. 19.

This species is perhaps closely related to A. panamensis but is distinguished by its larger pubescence, floral morphology and leaf characters. A. asperifolia bears some superficial resemblance to the present species, especially in its purple stem and rough upper leaf surface.

The staminate heads of the present species may sporadically possess a few filiform pistillate flowers on the edges of the staminate heads.

Pittier 14078 was collected at the same time and place as the type collection, Pittier 14079. It may have been intended that the pistillate plants belong to 14079 and the staminate plants to 14078. The holotype, Pittier 14079 (US) is a pistillate specimen.

From Cartago and San Jose, Costa Rica and Chiriqui, Panama (Fig. 21). The habitat of this species has been described as in moist, shady forests, on wet banks and on open hillsides, 1500-3000 m ele.

COSTA RICA: Prov. Cartago: at Cartago, Oersted 10.981 (C); Laguna del Reventado, Volcán Irazú, Pittier 14078 (F, GH, US); slopes of Volcán Irazú around Hotel Robert, Williams & Molina 13865 (GH, MO). Prov. San José: Río Burris, southern slope of Volcán de Irazú, Standley 35404 (US); Las Nubes, Standley 38396 (US); Cerro de las Vueltas, Standley & Valerio 43502 (GH, US). PANAMA: Prov. Chiriquí: open hillside, Volcán de Chiriquí, Davidson 991 (F, GH, US).

Fig. 21. Distribution of species of Archibaccharis in Central America. Square, *A. irazuensis*. Circle, *A. panamensis*.

Section II. Archibaccharis Section Hirtella J. D. Jackson, sec. nov.

Fruticibus subscandentibus vel vineis scandentibus caulibus vulgo fractiflexus vel raro volubilibus.

Subscandent shrubs or scandent vines, the stems usually noticeably fractiflex or if twining, fractiflex at least in the branchlets.

Taxa in this section occur from Nayarit and Hidalgo, Mexico to Dept. Chiriquí, Panama.

Type species: Archibaccharis hirtella (DC.) Heering.

Key to the Taxa in Section Hirtella

A. Plants subscandent; leaves sessile with green petioliform portions, the bases auriculate-amplexicaul; stems noticeably fractiflex and angled

B. Lower cauline leaves usually widening abruptly (often nearly truncate) above the petioliform portions; upper leaf surfaces hispidulous; leaf apices usually long-acuminate; apices of the filiform corollas of the pistillate heads with ligules 0.5-1.0 mm long with rather well-developed adjacent teeth; southern Chiapas, Mexico to Dept. Sacatepéquez, Guatemala . . . . . 16. A. Blakeana

BB. Lower cauline leaves widening more gradually above the petioliform portions; upper leaf surfaces hirtellous; leaf apices short-acuminate; apices of the filiform corollas of the pistillate heads with minute ligules and adjacent teeth, these difficult to discern even with magnification; known only from Oaxaca, Mexico . . . . 17. A. Pringlei

AA. Plants scandent; leaves with definite petioles, even though sometimes short; stems fractiflex or twining, angled or terete

C. Leaves coriaceous or thickly chartaceous, subglabrous, upper and lower surfaces shiny, the hairs sparse on the midribs and veins

D. Pistillate heads 5.0-6.4 mm high, staminate heads 3.5-4.5 mm high; pappus brown-tinged or red-brown; Vera Cruz, Mexico and Dept. Alta Verapaz, Guatemala . . . . 18. A. salmeoides

DD. Pistillate heads 7.0-8.0 mm high, staminate heads 5.5-6.5 mm high; pappus white; Honduras . . . . 19. A. lucentifolia

CC. Leaves thinner in texture, membranaceous to thickly chartaceous, rarely subglabrous, pubescent between the veins on the upper and lower surfaces although sometimes sparsely so, rarely shiny on either leaf surface

E. Main stems usually sharply fractiflex; pistillate heads 3.5-5.5 mm high, staminate heads 3.0-6.0(-7.0) mm high, mature disk flowers of both pistillate and staminate heads cream, whitish, green-white or green-white becoming purple at maturity

F. Plants slender, older stems not deeply sulcate; leaves elliptical, variously ovate or lanceolate and obtuse or attenuate at bases; glands on leaf surfaces stalked if present; style branches of disk flowers usually rhombic-oblong and acute or acuminate, at least not oblong or linear

G. Stem pubescence eglandular

H. Stem pubesence above distinctly brown or sordid; pilose or pilosulous . . . . 20. _A._ _hirtella_ var. _taeniotricha_

HH. Stem pubesence above whitish or with only a suggestion of brown; pilose or pilosulous

I. Leaves usually elliptical but sometimes oblong-ovate or ovate and acuminate or just acute at apices; lower leaf surfaces evenly stipitate-glandular and sparsely pilosulous, the glands amber; Oaxaca, Mexico . . . . 20a. _A._ _hirtella_ var. _albescens_

II. Leaves usually ovate and long-acuminate at apices; lower leaf surfaces lacking stipitate amber glands, pilosulous with perhaps some hirtellous hairs; Vera Cruz, Mexico . . . 20b. _A._ _hirtella_ var. _intermedia_

GG. Stem pubescence glandular . . . . 20c. _A._ _hirtella_ var. _hirtella_

FF. Plants stout, older stems often deeply sulcate, becoming hollow in pith region; leaves chiefly broadly ovate and cuneate, cuneate-rounded or subobtuse at bases and usually with scattered superficial amber or whitish glands on both surfaces; style branches of disk flowers oblong or linear, acute . . . . 21. _A._ _Schiedeana_

EE. Main stems twining, the striations usually appearing twisted, sordid-brown or dark-brown; heads somewhat larger, pistillate heads 5.5-7.0 mm high, staminate heads 5.0-7.5 mm high; flowers white, green-white light-cream or rarely with a suggestion of pink; style branches linear or rarely oblong . . . . 22. _A._ _flexilis_

16. ARCHIBACCHARIS BLAKEANA Standl. & Steyerm., Field Mus. Bot. 22: 296-297. 1940. Type: GUATEMALA: Dept. Sacatepéquez: near Antigua, brushy slope, 1500-1600 m ele., November 1938-February 1939, Standley 58597 (F!; photo. MIN!; isotype: GH!).

Subscandent shrubs; ca. 15-30 dm tall; above-ground parts with whitish or brown pubescence; roots fibrous. Stems fractiflex, obtusely 4-5 angled below, the younger portions subterete or sometimes sharply angled, flexuous, glaucescent, the bases ca. 7.0 mm in diam., graduating to 2.0-4.0 mm above, the internodes 1.0-10.0 cm long, somewhat shiny, gray-green below, red-brown or gray above, glabrescent below, villosulous above. Leaves sessile, the narrow petioliform portions 2.0-10.0 mm wide, often lacking on immature leaves; blades often widening abruptly on the older cauline leaves, sometimes widening gradually below the middle especially on younger leaves, ovate, oblong-ovate or broadly ovate, rarely orbicular, 5.5-15.5 cm long, (2-)4.0-8.5 cm wide, thinly chartaceous, auriculate-amplexicaul at bases, usually long-acuminate at apices, sometimes falcate, margins distally serrate, undulate or merely denticulate, hispidulous, upper surfaces dark-green, dull, sparsely hispidulous, lower surfaces lighter green, dull, subglabrous with some hispidulous and villosulous hairs. Panicles convex on villosulous peduncles. Pistillate Heads: 4.0-6.0 mm high, 3.0-5.0 mm wide, phyllaries 5-6 seriate, acute, the outer ones narrowly triangular or oblong and sometimes puberulous along their entire length, the middle ones linear-lanceolate and puberulous near their apices, the inner ones linear-lanceolate, glabrous; filiform ray flowers 30-53, pappus 2.9-3.3 mm long, white, corollas 3.0-3.3 mm long, green-white, finely and sparsely puberulous, the ligules short, 0.5-1.0 mm long, usually with a central, larger tooth, the ligular sinuses often bear 1-2 separate or fused lateral, long, erect, linear or subulate lobes, these not exceeding the ligules, achenes 1.2-1.4 mm long, 2-3 nerved, shiny and usually finely and sparsely hispidulous; disk flowers 1-3, pappus 2.9-3.8 mm long, corollas 3.4-3.8 mm long, green-white, anthers sterile, achenes abortive, reduced to small knobs. Staminate Heads: 4.0-6.0 mm high, ca. 4.0 mm wide, phyllaries 4-5 seriate; disk flowers 17-25, green-white, pappus 3.0-3.4 mm long, white, tubes 1.0-1.3 mm long, subglabrous, limb 2.1-3.2 mm long, subglabrous with antrorse hairs, lobes triangular or merely acute, 0.6-0.9 mm long and with a few scattered hairs on the dorsal surfaces, style branches linear or barely linear-lanceolate, long-acuminate or acute, achenes abortive, reduced to small knobs.

Chromosome number: n = 9 (Jackson, 1969), Fig. 2.

Pollen diameters (microns): polar, 16.7-20.5; equatorial, 18.9-23.3; Jackson 1036, Williams, Molina & Williams 22998.

Floral illustrations: Fig. 22.

Archibaccharis Blakeana is a weak-stemmed scrambler, dependent on adjacent plants for much of its support.

In most of the floral and vegetative characters as well as habit, A. Blakeana matches A. Pringlei from the state of Oaxaca,

Mexico, very closely. When one has both species in hand, they seem distinct although this is difficult to convey. The petioliform portion of the usually broader leaves of A. Blakeana are consistently narrower than those parts of the leaves from A. Pringlei, especially when upper leaves are compared. The basal portions of the leaf blades of the older cauline leaves (above the petioliform part) are often very wide and nearly truncate in A. Blakeana. These leaves of A. Pringlei narrow gradually to the petioliform portion by a more cuneate form. Also, when the leaf apices are compared, A. Pringlei presents a short-acuminate form in contrast to a long-acuminate form in A. Blakeana. The leaf texture is consistently thinner in A. Blakeana although both species have chartaceous leaves. They were described as "thickly" and "thinly" chartaceous. The pubescence may be helpful, being usually shorter, less dense and generally rougher to the touch on the upper leaf surfaces of A. Blakeana. The most useful distinguishing feature is perhaps found on the apices of the filiform corollas of the pistillate heads. The ligules and teeth are markedly better developed on A. Blakeana corollas when compared to those of A. Pringlei. There would seem to be a close genetic relationship between these species. In these species, the differences noted seem sufficient to justify the assumption of genetic isolation until this can be tested.

From Chiapas, Mexico and Chimaltenango, Quezaltenango and Sacatepequez, Guatemala (Fig. 23). A. Blakeana has been collected in moist woods, barrancas and thickets, 1500-3000 m ele.

GUATEMALA: Dept. Chimaltenango: Finca La Alameda, near Chimaltenango, Standley 59106 (F); same location as the preceding, Standley 79838 (F). Dept. Guatemala: 10 km south of San Raimundo, Standley 62895 (F). Dept. Quezaltenango: mountains above Río Samalá, 2 km west of Zunil, Williams, Molina & Williams 22998 (NY). Dept. Sacatepéquez: Cerro de la Cruz, Antigua, Jackson 1036 (A, B, BM, C, DS, F, G, GH, K, MICH, MIN, MO, MSC, NY, P, POM, TEX, UC, US, WIS); along road to Finca El Hato, above Antigua, Jackson 1038 (A, B, DS, F, G, GH, K, MICH, MIN, MO, NY, P, POM, TEX, US); above Pastores, Standley 60817 (F, GH, US); Finca El Hato, Standley 61197 (F); barranca above Dueñas, Standley 63227 (F). MEXICO: State of Chiapas: Mount Ovando, Matuda 0706 (MICH, US).

17. ARCHIBACCHARIS PRINGLEI (Greenm.) Blake, Contr. U. S. Nat. Herb. 23: 1508. 1926. Baccharis Pringlei Greenm., Proc. Amer. Acad. 41: 259-260. 1905. Hemibaccharis Pringlei (Greenm.) Blake, Contr. U. S. Nat. Herb. 20: 547. pl. 48. 1924. Type: MEXICO: State of Oaxaca: wet ravines, Sierra de San Felipe, 2285 m ele., 11 December 1895, Pringle 7014 (GH!; photo. MIN!).

Subscandent shrubs; ca. 30 dm tall; above-ground parts with white pubescence; roots fibrous. Stems fractiflex, terete or 5-angled, flexuous, glaucescent, the bases ca. 6.0 mm in diam., graduating to 2.0-3.0 mm above, the internodes 1.5-10.0 cm long,

somewhat shiny, dark-brown below, villosulous with some hirtellous hairs above. Leaves sessile, the petioliform portions 1.0-2.5 cm wide, often lacking on immature leaves; blades usually widening gradually below the middle on all cauline leaves, ovate, 4.0-14.0 cm long, 3.0-7.3 cm wide, thickly chartaceous, auriculate-amplexicaul at bases, short-acuminate at apices, margins distally serrate, hispidulous with some hirtellous hairs, upper surfaces dark-green, dull, quite evenly and somewhat densely hirtellous, sometimes finely arachnose as well, lower surfaces lighter green, dull, sparsely hirtellous and sometimes with fine arachnose hairs. Panicles convex on villosulous peduncles. Pistillate Heads: 6.0-6.5 mm high, ca. 4.0 mm wide, phyllaries 4-5 seriate, acute or rarely obtuse, the outer ones long-triangular, linear or barely linear-lanceolate and puberulous near the apices, the inner ones linear or linear-lanceolate and becoming glabrous; filiform ray flowers 35-40, pappus 2.7-3.3 mm long, white, corollas 3.2-3.7 mm long, green-white, sparsely puberulous above but sometimes to the bases, the ligules extremely minute with 2-3 upper teeth, usually with 2 smaller, shorter teeth adjacent to the ligular sinuses or sometimes with only one lower tooth, achenes 1.1-1.3 mm long, 2-nerved, shiny and hispidulous; disk flowers 1-3(-26), pappus 3.2-3.5 mm long, corollas 3.4-3.7 mm long, green-white, anthers sterile, achenes abortive, reduced to small knobs. Staminate Heads: 4.0-5.5 mm high, 4.0-5.0 mm wide, phyllaries 4-5 seriate; disk flowers 12-29, green-white, pappus 3.2-3.7 mm long, white, tubes 1.1-1.3 mm long, subglabrous, limb 2.2-2.9 mm long, subglabrous or very sparsely puberulous, lobes triangular, 0.6-0.9 mm long, the dorsal surfaces with a few hairs at their apices, style branches oblong-lanceolate or just oblong, long-acuminate, achenes abortive, reduced to small knobs.

Chromosome number: 2n = 18 (Jackson, 1969), Fig. 2.

Pollen diameters (microns): polar, 16.7-18.9; equatorial, 18.9-21.0; Jackson 1031.

Floral illustrations: Fig. 22.

Archibaccharis Pringlei is a weak-stemmed scrambler and its long distal portions are dependent upon other plants for support.

Jackson 1031 probably represents the first-known collection of the pistillate specimens of A. Pringlei. This species was first placed in the genus Baccharis by Greenman (1905) and then in the genus Archibaccharis by Blake (1926) on the basis of a single staminate specimen. These judgements were confirmed by the structure of the pistillate heads. A. pringlei is closely related to A. Blakeana from southern Mexico and Guatemala. The two species are identical in habit but differ somewhat in pubescence, leaf morphology and the structure of the pistillate corolla, cf. the discussion of A. Blakeana.

Although Sierra de San Felipe del Agua was ascended twice by the author via the eastern and western slopes, A. Pringlei was located in only one barranca on the western slope which is known locally as "Rincon de la Guerta," which literally means "corner

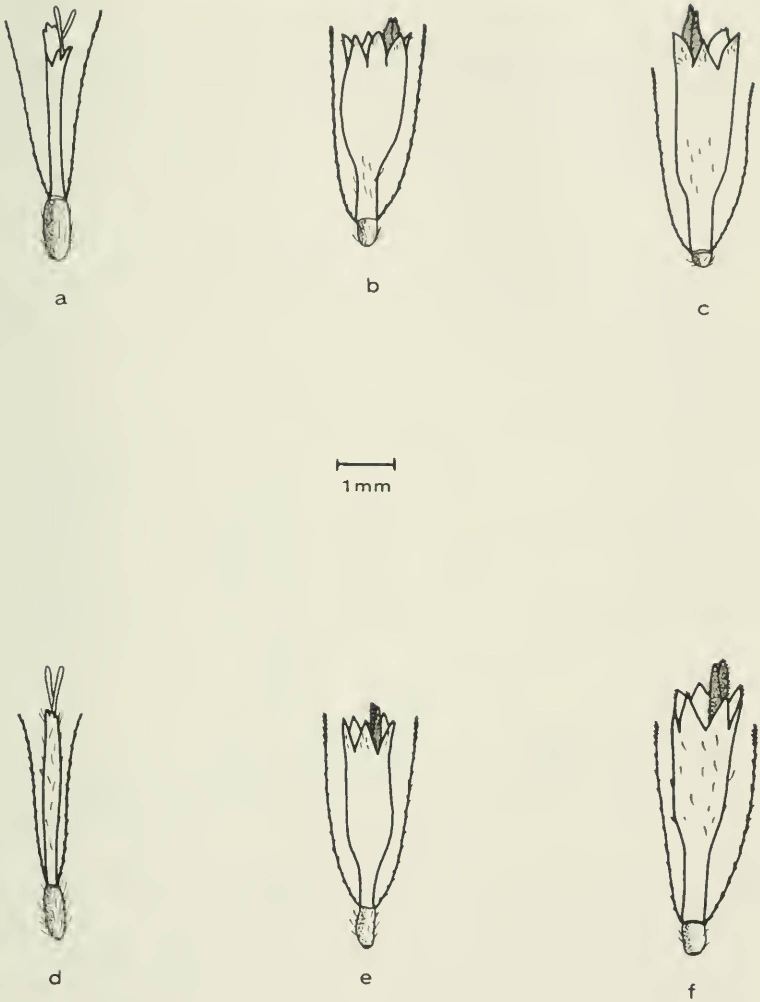

Fig 22. Floral illustrations of Archibaccharis Blakeana and A. Pringlei. A. Blakeana (all from Jackson 1036): (a, b) pistillate heads: (a) filiform flower, (b) disk flower; staminate heads: (c) disk flower. A. Pringlei (all from Jackson 1031: (a, b) pistillate heads: (d) filiform flower, (e) disk flower; staminate heads: (f) disk flower. Disk flower are shown without anthers.

Fig. 23. Distribution of species of Archibaccharis in Mexico and Guatemala. Circle, A. Blakeana. Triangle, A. Pringlei.

or narrow valley of the orchard."

Apparently the ratio of disk flowers to filiform ray flowers in the pistillate heads is quite variable. Extremes from 0-40 were found when the filiform ray flowers were counted. The disk flowers varied from 1-26. The variation was often great even when heads on the same plant were compared. In all cases, the achenes of the disk flowers appeared abortive and their anther sacs were sterile.

The achenes of A. Pringlei were germinated without difficulty in petri dishes at room temperature. Some plants were kept in flower pots (sterile potting soil) where they survived for several months with little growth in height. Others were transplanted to garden soil (June-September, Minnesota) in moist, shady conditions where they appeared healthy but grew little in height. These plants succumbed to the first frost conditions. It was the author's purpose to observe the development of the broad petioliform portion of the leaves. The seedlings possessed naked petioles devoid of the lateral green margin and only after some time did they develop the green petioliform part of the leaf which is so characteristic of this species.

Known only from the type location in Oaxaca, on Sierra de San Felipe del Agua, north of the city of Oaxaca (Fig. 23). This perennial shrub was collected in a shaded, moist barranca and in adjacent drier, exposed areas, 2100-2285 m ele.

MEXICO: State of Oaxaca: Sierra de San Felipe del Agua, Jackson 1031 (A, B, BM, C, DS, F, G, GH, K, MICH, MIN, MO, MSC, NY, P, POM, TEX, UC, US, WIS).

18. ARCHIBACCHARIS SALMEOIDES Blake, Journ. Washington Acad. Sci. 17: 61. 1927. Hemibaccharis salmeoides Blake, Contr. U. S. Nat. Herb. 20: 548. pl. 50. 1924. Type: GUATEMALA: Dept. Alta Verapaz: Cobán, 1350 m ele., February 1907, von Türckheim II 1641 (US!; photo. MIN! UC!; isotypes: C! G! GH! US!).

Scandent vines; height unknown; above-ground parts brown-pubescent where hairs are present; subterranean parts and the bases not seen. Stems fractiflex but not sharply so, terete, 1.0-5.0 mm in diam. above, the internodes 0.7-12.0 cm long, somewhat shiny, brown or gray-brown, glabrescent below, hirtellous with some pilosulous hairs above. Leaves with petioles 2.0-13.0 mm long, pilosulous with a few hirtellous hairs; blades narrowly or broadly elliptic, lance-elliptic, barely lance-ovate or more broadly ovate, 5.0-9.0 cm long, 1.5-6.0 cm wide, thickly chartaceous or coriaceous, cuneate or obtuse at bases, long or short-acuminate at apices, margins subentire or distally denticulate, subglabrous, upper surfaces dark-green, shiny, subglabrous, lower surfaces lighter green than the upper surfaces but dark, shiny but duller than the upper surfaces, subglabrous or rarely with scattered pilosulous hairs. Panicles rounded or sometimes pyramidal on peduncles bearing hirtellous and sometimes

pilosulous hairs. Pistillate Heads: 4.0-6.4 mm high, 3.0-4.0 mm wide, phyllaries ca. 5-seriate, acute, the outer ones ovate becoming lance-ovate and sometimes pilosulous, the inner ones linear-lanceolate and glabrous; filiform ray flowers 8-22, pappus 3.0-4.0 mm long, brown-tinged or red-brown, the regular bristles often mixed with short, hyaline setae, corollas 2.6-2.9 mm long, probably whitish to yellow-brown below but tipped with pink or purple, puberulous above, the ligules sometimes greatly reduced, 0.2-0.7 mm long, achenes 1.0-1.9 mm long, 3(-4) nerved, somewhat shiny and hispidulous; disk flowers 1-4, pappus 3.4-3.6 mm long, corollas 3.9-4.4 mm long, probably whitish to yellow brown below, the lobes tipped with pink to purple, anthers sterile, achenes abortive, stipitiform or reduced to small knobs. Staminate Heads: 3.5-4.0 mm high, ca. 3.5 mm wide, phyllaries ca. 4-seriate; disk flowers ca. 24, probably whitish to yellow-brown below, the lobes tipped with pink to purple, pappus 1.9-2.4 mm long, brown-tinged or red-brown, the regular bristles often mixed with short, hyaline setae, tubes 1.2-1.8 mm long, thickly puberulous to the bases, limb 1.5-1.9 mm long, puberulous mostly below, lobes barely elliptic or lance-ovate, the bases usually narrower than the broadest point of the lobes, 1.2-1.4 mm long, the apices sparsely puberulous, style branches rhombic-oblong, lance-elliptic or rarely subclavellate, short-acute, achenes abortive, reduced to small knobs.

Pollen diameters (microns): polar, 17.5-21.0; equatorial, 19.5-23.0; Linden 1132.

Floral illustrations: Fig. 24.

Archibaccharis salmeoides resembles A. lucentifolia from Honduras quite closely. The two species perhaps differ in habit, especially dependency for support, but this remains to be verified. The heads, phyllaries and flowers of A. salmeoides are smaller than those of A. lucentifolia. The morphology of the disk flowers appears to differ consistently. In addition, the terminal branchlets are sharply fractiflex in the Honduran species while only slightly so in the few available collections of A. salmeoides. Color differences also exist which may or may not prove to be reliable.

The type collection of A. salmeoides, von Türckheim II 1641, was actually a mixed collection. That number, as represented by specimens from the F, MICH and MO Herbaria is A. Schiedeana. Further, von Türckheim II 1404, cited below, is also A. Schiedeana as represented in the Gray Herbarium.

The staminate specimens of A. salmeoides may now be described for the first time. Old, previously unidentified collections by Linden and Galeotti from Vera Cruz, Mexico proved to be of this species and provided both pistillate and staminate material.

Known only from the type location, Cobán, Guatemala and now from Vera Cruz, Mexico (Fig. 25). It is presumed that this species may be found in the moist woods surrounding Cobán, Guatemala (author visit). The Linden and Galeotti collections from Vera Cruz, Mexico had no ecological notes except 1350-3000 m ele.

GUATEMALA: Dept. Alta Verapaz: Cobán, von Türckheim II 1404, in part (BM); von Türckheim II 1657 (C, NY); Cobán, von Türckheim 4159 (GH). MEXICO: State of Vera Cruz: peak of Orizaba, Galeotti 2179 (G); Cordillera, Vera Cruz, Galeotti 2321 (G, P); Tototsinapa, Linden 1132 (G, K, P).

19. ARCHIBACCHARIS LUCENTIFOLIA L. Wms., Fieldiana 29(7): 388-389. 1962. Type: HONDURAS: Dept. Morazán, 2000 m ele., 25 March 1951, Williams & Williams 17497 (F!; photo. MIN!; isotypes: GH! US!).

Scandent vines; height unknown; above-ground parts mostly brown-pilosulous but usually with some white-tomentulose and villosulous hairs where hairs are present; subterranean parts and the bases not seen. Stems fractiflex, the branchlets strongly so, terete, 1.5-3.0 mm in diam. above, the internodes 1.0-6.0 cm long above, barely shiny, red-purple, sometimes green or gray-brown, glabrescent below, pilosulous and often with tomentulose hairs mixed with some villosulous hairs above. Leaves with petioles 2.0-8.0 mm long, pilosulous; blades ovate, elliptic, oblong-elliptic or lance-elliptic, 3.0-12.0 cm long, 3.0-4.5 cm wide, coriaceous, cuneate or somewhat rounded at bases, acuminate or acute at apices, margins entire, distally denticulate or serrulate, upper surfaces dark-green, shiny, subglabrous with some tomentulose and pilosulous hairs, lower surfaces lighter green than the upper surfaces but dark, somewhat shiny, sparsely pubescent. Panicles convex on peduncles with mostly pilosulous peduncles, these hairs often mixed with tomentulose and villosulous pubescence. Pistillate Heads: 7.0-8.0 mm high, ca. 4.0 mm wide, phyllaries ca. 5-seriate, mostly obtuse or sometimes acute, the outer ones ovate or ovate-oblong and essentially glabrous, the inner ones linear-lanceolate and glabrous; filiform ray flowers 10-14, pappus 4.4-4.6 mm long, white, corollas 3.1-3.7 mm long, white below but tipped with purple, thickly puberulous near the apices, the ligules erect, 0.3-0.6 mm long, glabrous, achenes 1.0-1.5 mm long, 3-nerved, barely shiny and hispidulous; disk flowers 2, pappus ca, 4.2 mm long, corollas 4.0-5.4 mm long, white below but the lobes becoming purple, anthers sterile, achenes abortive, inane or stipitiform. Staminate Heads: 5.5-6.5 mm high, 3.5-4.0 mm wide, phyllaries ca. 5-seriate; disk flowers ca. 12, white below but the lobes becoming purple, pappus 3.6-4.0 mm long, white, tubes 2.0-2.5 mm long, puberulous below, limb 2.0-3.0 mm long, puberulous below, lobes triangular, rarely two are fused nearly to their bases, 1.6-2.2 mm long, the apices finely puberulous, style branches clavellate or nearly oblong, acute or short-acuminate, achenes abortive, reduced to small knobs.

Pollen diameters (microns): polar, 25.5-32.1; equatorial, 28.9-35.5; Williams, Molina, Burger & Wallenta 17004, Williams & Molina 13732.

Floral illustrations: Fig. 24.

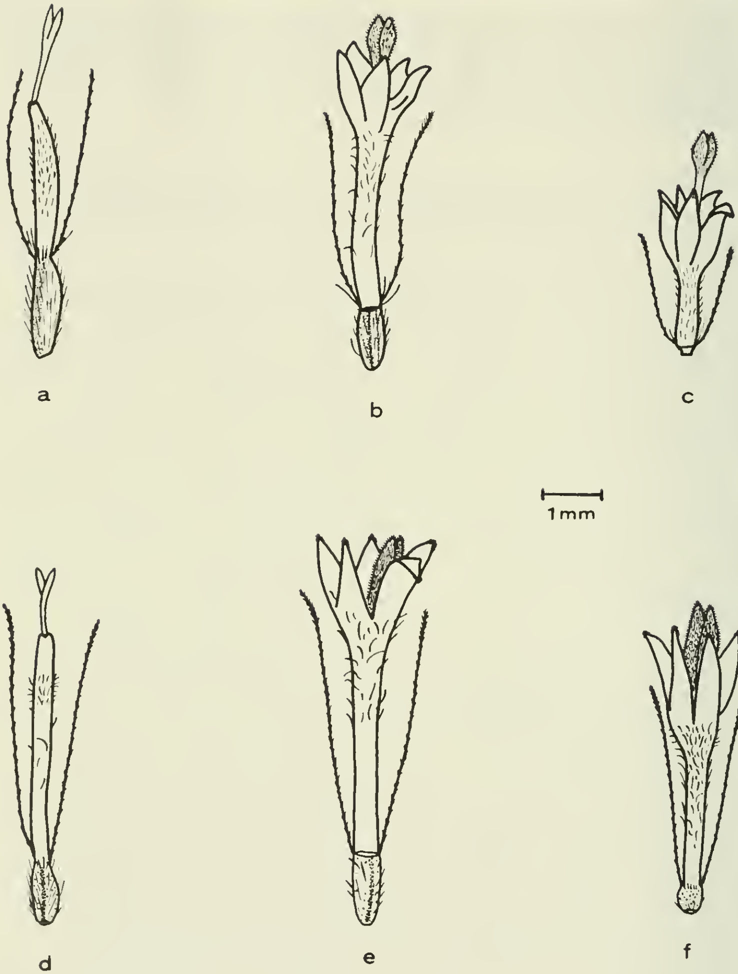

Fig. 24. Floral illustrations of Archibaccharis salmeoides and A. lucentifolia. A. salmeoides: (a, b) pistillate heads (von Turckheim 1641): (a) filiform flower, (b) disk flower; staminate heads: (c) disk flower (Linden 1132). A. lucentifolia: (d, e) pistillate heads (Molina, Williams, Burger & Wallenta 16990): (d) filiform flower, (e) disk flower; staminate heads: (f) disk flower (Williams, Molina, Burger & Wallenta 17004). Disk flowers are shown without anthers.

Fig. 25. Distribution of species of Archibaccharis in Mexico and Central America. Circle, *A. salmeoides*. Triangle, *A. lucentifolia*.

Vernacular names: "Amargoso" in Dept. Morazán, Honduras.

Archibaccharis lucentifolia strongly resembles A. salmeoides from Guatemala and Mexico in its vegetative characters. They differ somewhat in the pubescence of the upper branches and peduncles. Consistent distinctions are found in the heads and floral characters. A. salmeoides is perhaps a stouter plant. Additional collections of both species are needed.

In the original description of A. lucentifolia, Williams (1962, p. 388) cited a Williams & Molina collection without number as the type. Dr. Williams has confirmed that an oversight did occur in his publication (personal communication). The type collection is correctly Williams & Williams 17497, the holotype housed at the Field Museum, Chicago. Apparently a recording error occurred on the US isotype as it was dated "25 March 1961." The holotype is dated "25 March 1951."

Williams (1962, p. 388) referred von Türckheim II 1164 (US) to A. lucentifolia L. Wms. Because that collection number is unknown to the author and von Türckheim II 1641 (US) was annotated as "A. lucentifolia L. Wms.," the latter number appears to be the one Dr. Williams intended to cite, a specimen properly referred to A. salmeoides. In fact, von Türckheim II 1641 is the type collection of A. salmeoides.

Known only from the type locality (Fig. 25). This scandent vine has been collected in wet cloud forest on Mountain La Tigre and adjacent mountains above San Juancito, 1800-2100 m ele.

HONDURAS: Dept. Morazán: on mountain La Tigre, southwest of San Juancito, Molina, Williams, Burger & Wallenta 16990 (F, NY); same location as the preceding, Molina, Williams, Burger & Wallenta 17004 (BM, F, GH, NY); on mountain La Tigre, between Jutiapa and Quebrada La Tigre, southeast of San Juancito, Molina 20289 (BM); in San Juancito Mountains above San Juancito, Williams & Molina 13732 (BM, F, GH, US).

20. ARCHIBACCHARIS HIRTELLA (DC.) Heering var. TAENIOTRICHA Blake, Journ. Washington Acad. Sci. 24: 434. 1934. Type: GUATEMALA: Dept. Chimaltenango: cypress woods, Santa Elena, 2400-2700 m ele., 24 February 1933, Skutch 276 (US!; photo. MIN!; isotypes: A! DS! MICH!).

Scandent vines; ca. 30-60 dm tall; above-ground parts sordid or brown-pilosulous, the hairs spreading; roots fibrous. Stems usually fractiflex, terete but sometimes angled, the bases 5.0-10.0 mm in diam., graduating to 1.0-4.0 mm above, rather slender, the internodes 1.0-6.0 cm long, gray-brown or brown below, brown above, glabrescent below, becoming thickly pilosulous above. Leaves with short petioles, 1.0-8.0 mm long, pilosulous; blades ovate, oblong-ovate or elliptical, 2.5-10.5 cm long, 1.5-4.0 cm wide, thickly chartaceous, chartaceous or submembraanaceous, obtuse at bases, acuminate or just acute at apices, margins distally serrate, serrulate or merely denticulate, pilosulous, with some hispidulous hairs, upper surfaces dark-green,

shiny, often densely pilosulous with some hispidulous hairs, sometimes sparsely so, lower surfaces dark-green, pilosulous but usually with some hirtellous hairs. Panicles rather loose and small on densely pilosulous peduncles. Pistillate Heads: 4.5-5.5 mm high, 2.0-2.5 mm wide, phyllaries ca. 5-seriate, acute, the outer ones lanceolate and pilosulous, the inner ones linear-lanceolate, essentially glabrous or sparsely pilosulous; filiform ray flowers 10-18, pappus 2.7-3.3 mm long, brown-tinged or white, corollas 1.9-2.8 mm long, green-white becoming dark-purple especially above at maturity, puberulous above, the ligules erect, 0.3-0.6 mm long, glabrous, achenes 0.8-1.5 mm long, 3-4 nerved, shiny and finely hispidulous; disk flowers 1-2, pappus 2.6-3.6 mm long, corollas 3.0-3.9 mm long, green-white becoming purple especially above at maturity, anthers sterile, achenes abortive, inane. Staminate Heads: 3.0-4.5 mm high, 2.0-2.5 mm wide, phyllaries ca. 4-seriate; disk flowers 15-25, green-white becoming purple especially above at maturity, pappus 1.4-2.8 mm long, brown-tinged or white, tubes 1.4-2.0 mm long, puberulous above, limb 1.2-2.2 mm long, puberulous especially below, lobes oblong or barely linear, 0.9-1.3 mm long, the dorsal surfaces glabrous or rarely sparsely puberulous, style branches rhombic-oblong or subclavellate, shortly acuminate or acute, achenes abortive, reduced to small knobs.

Chromosome number: n = 9 (Jackson, 1969), Fig. 2.

Pollen diameters (microns): polar, 16.7-21.0; equatorial, 17.8-22.2; Jackson 1042, Steyermark 43081.

Floral illustrations: Fig. 26.

Archibaccharis hirtella var. taeniotricha is closely related to A. hirtella var. hirtella and its varieties, var. intermedia and var. albescens. These taxa are very similar in habit and floral morphology. Future studies may more fully justify the elevation of each of these varieties to species status. I suspect they may represent distinct biological entities.

A. hirtella var. taeniotricha is distinguished by its densely brown-pilosulous stems and leaves bearing eglandular hairs. Two collections cited by Blake (1934, p. 434) as A. hirtella var. taeniotricha have been cited in this paper as representing a new taxon, A. hirtella var. albescens. Pringle 4988 and Smith 259 from Sierra de Clavellinas, Oaxaca as well as my own collection from Sierra de San Felipe del Agua, Oaxaca belong to this new variety which is distinguished from Blake's var. taeniotricha by the presence of glandular hairs on the under leaf surfaces and the color of the stem pubescence.

Skutch's notes on the label of the type collection indicated that this species is "sometimes epiphytic and rooted on moss-covered trunks." This condition was not observed by the author when a collection was made at the type location or in an El Salvador population.

From Chiapas, Mexico; Chimaltenango, Guatemala, El Progresso, Jalapa, Quezaltenango, San Marcos and Solola in Guatemala as well as San Salvador, El Salvador (Fig. 27). The habitat of this

climbing vine has been variously described as on moist, wooded slopes, in thickets, in ravines and in cloud forests, 1200-3800 m ele.

EL SALVADOR: Dept. San Salvador: Volcán San Salvador, from Finca Las Brumas to the peak of the volcano, Carlson 460 (F, UC). GUATEMALA: Dept. Chimaltenango: Santa Elena on Cerro de Tecpán, Jackson 1042 (B, BM, C, F, G, GH, K, MICH, MIN, MO, MSC, NY, P, UC, US); Santa Elena, Skutch 769 (K); region of Los Positos, above Las Calderas, Standley 80177 (F, G). Dept. Guatemala: Lake Amatitlán, Kellerman 5313 (F); Volcán Pacaya, Kellerman 6363 (F, US). Dept. El Progresso: near summit, between Calera and summit of Volcán Siglo, Steyermark 43081 (F, NY); hills between Finca Piamonte and slopes southeast of Finca Piamonte, Steyermark 43392 (F, NY). Dept. Jalapa: Volcán Jumay, north of Jalapa, Steyermark 32345 (F); around waterfall, Montana Miramundo, Steyermark 32841 (F, GH). Dept. Quezaltenango: between Santa María de Jesús, Los Majadas and summit of volcano, Volcán Santa Maria, Steyermark 33972 (F). Dept. San Marcos: along road between San Sebastián at km 21 and km 8, 8-18 miles northwest of San Marcos, Steyermark 35660 (F); along Quebrada Canjulá, Volcán Tacaná, Steyermark 36041 (F, MICH). Dept. Solola: near Nahualá, Sierra Madre Mountains, Williams, Molina & Williams 23186 (NY). MEXICO: State of Chiapas: near Zinacantán, Laughlin 2239 (DS, MICH); ridge north of Clinica Yerba Buena near Pueblo Nuevo Solistahuacan, Municipio of Pueblo Nuevo Solistahuacan, Raven & Breedlove 19985 (MICH); in Paraje Shohleh, Municipio of Tenejapa, Ton 560 (MICH, NY).

20a. ARCHIBACCHARIS HIRTELLA (DC.) Heering var. ALBESCENS J. D. Jackson, Phytologia 28(3): 298-300. Fig. 1. 1974. Type: MEXICO: State of Oaxaca: oak woods, Sierra de Clavellinas, 2812 m ele., 18 October 1894, Pringle 4988 (MIN!; isotypes: BM! G! GH! K! MICH! MO! MSC! NY! P! POM! UC!).

Known only from Oaxaca, Mexico (Fig. 27). This variety is a scandent vine closely allied with Archibaccharis hirtella (DC.) Heering var. taeniotricha Blake.

Ca. 50-70 dm tall, sordid-pilosulous hairs below becoming whitish above on the branches and leaves; leaves elliptical but sometimes oblong-ovate or ovate, 3.5-6.5 cm long, 1.0-2.5 cm wide, acuminate or just acute at apices, the lower surfaces pilosulous and rather evenly stipitate-glandular; panicles small and close, the pistillate heads 3.5-4.0 mm high, the staminate heads 3.5-4.0 mm high, the phyllaries glabrous.

The specific epithet "albescens" refers to the sordid hairs on the lower parts of the plant which become whitish above.

Chromosome number: n = 9 (Jackson, 1969), Fig. 2.

Pollen diameters (microns): polar, 15.0-20.0; equatorial, 16.7-21.0; Jackson 1025, Smith 259.

Floral illustrations: Fig. 26.

20b. ARCHIBACCHARIS HIRTELLA (DC.) Heering var. INTERMEDIA Blake, Journ. Washington Acad. Sci. 24: 434. 1934. Type: MEXICO: State of Vera Cruz: shaded banks near Orizaba, 1313 m ele., 25 January 1895, Pringle 6108 (US!; photo. MIN!; isotypes: BM! C! F! GH! K! MICH! MIN! MO! MSC! NY! P! POM! UC!).

Scandent vines(?); ca. 6-15 dm tall; above-ground parts brownish-pilosulous, the hairs spreading; the subterranean parts and the bases not seen. Stems essentially straight but sometimes obscurely fractiflex, terete, 0.5-3.0 mm in diam. above, the internodes 0.5-5.0 cm long above, somewhat shiny, brown-purple becoming brown then green on the branches and branchlets, glabrescent below, pilosulous or minutely pubescent above. Leaves with short petioles, 2.0-4.0 mm long, pilosulous, blades usually quite broadly ovate, 2.5-5.0 cm long, 1.5-3.0 cm wide, chartaceous, obtuse or subcordate at bases, usually long-acuminate but sometimes long-acute and often falcate at apices, margins distally serrate, serrulate or merely denticulate except for entire apices, sparsely hirtellous, upper surfaces dark-green, somewhat shiny, subglabrous, lower surfaces dark-green, barely lighter color than the upper surfaces, somewhat shiny, sparsely pilosulous with some hirtellous hairs or subglabrous. Panicles usually small and rather loose on pilosulous or minutely pubescent peduncles. Pistillate Heads: 4.0-5.0 mm high, 2.0-2.5 mm wide, phyllaries 5-seriate, acute, the outer ones ovate and sometimes sparsely pilosulous, the inner ones linear-lanceolate and glabrous; filiform ray flowers 19-24, pappus 1.8-2.5 mm long, brown-tinged, corollas 1.2-1.7 mm long, green-white becoming purple at maturity, rather thickly puberulous above, the ligules erect, 0.1-0.4 mm long, glabrous, achenes 0.9-1.3 mm long, 2-3 nerved, shiny and finely hispidulous; disk flowers 2-3, pappus 2.2-2.6 mm long, corollas 2.3-2.8 mm long, green-white becoming purple at maturity, anthers sterile, achenes inane. Staminate Heads: ca. 4.5 mm high, 2.0-2.5 mm wide, phyllaries ca. 4-seriate; disk flowers 13-16, green-white becoming purple at maturity, pappus 2.3-2.5 mm long, tubes 1.2-1.5 mm long, puberulous above, limb 1.6-2.0 mm long, puberulous below, lobes oblong, barely linear or sometimes narrowly triangular, 1.0-1.2 mm long, the dorsal surfaces glabrous, style branches rhombic-oblong or lance-elliptic, acuminate, achenes abortive, reduced to small knobs.

Pollen diameters (microns): polar, 16.7-19.4; equatorial, 18.9-21.0; Pringle 6108.

Floral illustrations: Fig. 26.

The leaf morphology of the few known specimens of var. intermedia seem to be distinct from all other varieties of Archibaccharis hirtella. The leaves are quite small, ovate and nearly always coarsely serrate with rather long, entire acuminate or acute apices. The plants bear eglandular pubescence throughout. The floral morphology and probably also the habit closely relate the present variety to the other varieties of A. hirtella. The general appearance of the specimens indicate that var. intermedia is a vine or at least a

scrambler.

Pringle 9853 and Nelson 1471, referred to A. hirtella var. intermedia by Blake (1934, p. 434) have been cited as A. Schiedeana in the present treatment.

From Vera Cruz, Mexico, known only from Orizaba, the type location (Fig. 27). The only available ecological information was provided by C. G. Pringle, "shaded banks near Orizaba, 1313 m ele."

MEXICO: State of Vera Cruz: Orizaba, Botteri 1170 (BM, G, P, K).

20c. ARCHIBACCHARIS HIRTELLA (DC.) Heering var. HIRTELLA, Jahrb. Hamb. Wissensch. Anst. 21: Beiheft 3: 41. 1904. Baccharis hirtella DC., Prodr. 5: 418. 1836. Hemibaccharis hirtella (DC.) Blake, Contr. U. S. Nat. Herb. 20: 549. 1924. Type: MEXICO: without definite locality, between Apapulco and the city of Mexico, 1791?, Haenke s.n. (G-DC!; photo. GH! TEX!; isotypes: fragments, F?! P!; photo. of P isotype, MIN!).

Scandent vines; ca. 20-80 dm tall; glandular-pubescent; roots fibrous. Stems fractiflex, terete, the bases 3.0-15.0 mm in diam., graduating to 1.0-3.0 mm above, rather slender, the internodes 1.0-9.0 cm long, dull, gray, gray-brown, red-brown, brown or green, the branchlets usually green, glabrescent below, glandular-puberulous above, the sordid or purple hairs often thickly glandular. Leaves with short petioles, 1.0-6.0 mm long, glandular-puberulous with some pilosulous hairs; blades elliptic, lanceolate, lance-ovate or ovate, 2.5-7.5 cm long, 1.0-3.0 cm wide, thinly chartaceous or membranous, attenuate or obtuse at bases with ragged margins on the winged portions, acuminate at apices, margins distally serrate, serrulate or merely denticulate, sparsely pilosulous and glandular puberulous, sometimes with hispidulous hairs, upper surfaces dark-green, dull, usually thickly glandular-puberulous with scattered pilosulous hairs, lower surfaces lighter green, barely glossy, usually glandular-puberulous with scattered pilosulous hairs. Panicles small and convex on chiefly glandular-puberulous peduncles. Pistillate Heads: 3.5-4.5 mm high, 2.0-3.0 mm wide, phyllaries ca. 4-seriate, acute, the outer ones ovate or lanceolate and glandular-puberulous, the inner linear-lanceolate and becoming glabrous; filiform ray flowers 17-34, pappus 1.8-2.4 mm long, brown-tinged or white, corollas 1.4-2.0 mm long, green-white or becoming dark-purple especially above at maturity, usually thickly puberulous above with few hairs below, the ligules erect, 0.3-0.7 mm long, glabrous, achenes 0.8-1.4 mm long, 3-4 nerved, shiny and finely hispidulous; disk flowers 1-3, pappus 2.0-2.4 mm long, corollas 2.2-3.0 mm long, green-white or becoming dark-purple especially above at maturity, anthers sterile, achenes inane. Staminate Heads: 3.0-4.0 mm high, 2.0-3.0 mm wide, phyllaries ca. 3-seriate; disk flowers 18-36, green-white or becoming dark-purple especially above at maturity, pappus 1.8-2.4 mm long, brown-tinged or white, tubes 1.0-1.8 mm long, puberulous above,

limb 1.2-1.8 mm long, puberulous below, lobes oblong or barely linear, 0.9-1.2 mm long, glabrous except for occasional short hairs near the apices, style branches rhombic-oblong, short-acuminate or acute, achenes abortive, reduced to small knobs.

Chromosome number: n = 9 (Jackson, 1969), Fig. 2.

Pollen diameters (microns): polar, 13.9-17.8; equatorial, 15.5-18.9; Rzedowski 21690, Matuda 25749.

Floral illustrations: Fig. 26.

Archibaccharis hirtella var. hirtella may be separated from the other varieties of the species by the presence of glandular-puberulous hairs on the upper portions of the stems, petioles, leaf blades and phyllaries.

Blake (1924, p. 549) cited Baccharis scandens Less., B. Schiedeana and B. Thomasii Klatt as species synonymous with B. hirtella DC. His placement of these names was based mostly on study of original descriptions. Of those listed, Blake did view the isotype of B. scandens Less. at the Gray Herbarium and noted its glandular-puberulous character. The names listed above were not removed from synonymy. The types of these names have been studied by the author and have been determined to be conspecific with Archibaccharis Schiedeana, a species lacking glandular hairs.

Information provided by the Haenke collection as represented at the Field Museum, Chicago, indicated the date of collection as "1791" and a number "1228," perhaps the collection number. The fragments on the sheet match the holotype of var. hirtella very well and the date correlated with Haenke's journey from Acapulco to the city of Mexico (Hemsley, 1881, pp. 119-120).

Collectors have reported var. hirtella to be a shrub. My collection from Meson Viejo, state of Mexico, was clearly a vine.

Known from Mexico, D. F., Guerrero, Morelos and Oaxaca, Mexico (Fig. 27). Collected on rocky slopes, in pine-oak woods, in open woods and hillsides and on moist slopes, 600-3200 m ele.

MEXICO: Federal District: Eslaba region, Lyonnet 3009 (US); Lomas de Mixcoac, Lyonnet & Elcoro 1739 (US); mountains above Eslaba, Pringle 11483 (C, F, GH, K, MICH, MO, MSC, US); Cañada of Contreas, Pringle 13986 (G, GH, MICH, MIN, MSC, UC, US). State of Guerrero: ca. 10 km west of Camotla, Municipio of Chichihualco, ca. 40 km west of Chilpancingo, Feddema 2747 (MICH); top of Sierra Madre near Chilpancingo, Nelson 2238 (GH, US); Cerro Alquitrán, cerca de Mazatlán, Municipio of Chilpancingo, Rzedowski 23688 (MICH, MSC); Carrizal, 9 km west of Camotla, Municipio of Chichihualco, Rzedowski 18048 (DS, MICH, MSC). State of Mexico: Sacromote Hill, near Amecameca, Beauchamp s.n. MO933661 (MO); San Nicolás, Valley of Mexico, Bourgeau 955 (G, US in part, K, P); same location as the preceding, Bourgeau 957 (C, G); foothill, Mt. Ixtaccihuatl, Deam s.n. US398950 (GH, US); jungle, Amecameca, Goodding 2173 (GH, MO, NY, POM, UC); Los Hornos locality, District of Temascaltepec, Hinton 2110 (BM, G, K, MO, US); same location as the preceding, Hinton 2832 (BM, G, K, NY); Mesón Viejo, along Mexican Highway #130,

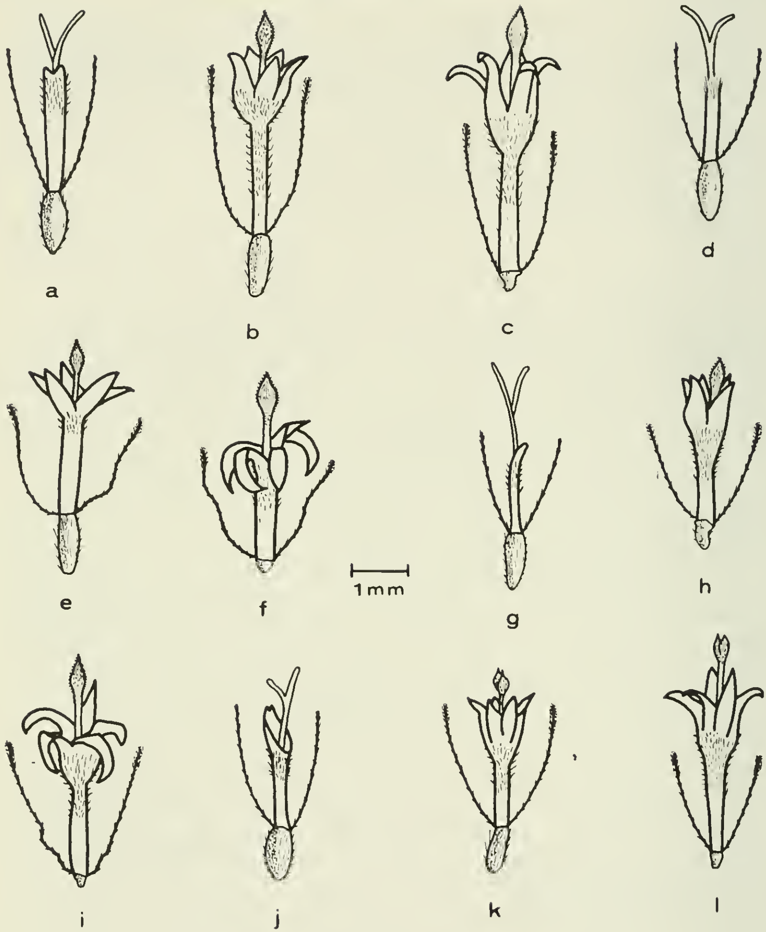

Fig. 26. Floral illustrations of the varieties of Archibaccharis hirtella. A. hirtella var. taeniotricha (all from Jackson 1042): pistillate heads: (a) filiform flower, (b) disk flower; staminate heads: (c) disk flower. A. hirtella var. albescens (all from Jackson 1025): pistillate heads: (d) filiform flower, (e) disk flower; staminate heads: (f) disk flower. A. hirtella var. intermedia (all from Pringle 6108): pistillate heads: (g) filiform flower, (h) disk flower; staminate heads: (i) disk flower. A. hirtella var. hirtella: (j, k) pistillate heads (Purpus 1499): (j) filiform flower, (k) disk flower; staminate heads: (l) disk flower (Jackson 1046). Disk flowers are shown without anthers.

Fig. 27. Distribution of the varieties of Archibaccharis hirtella in Mexico and Central America. Open square, A. hirtella var. taeniotricha. Triangle, A. hirtella var. albescens. Filled square, A. hirtella var. intermedia. Circle, A. hirtella var. hirtella.

Jackson 1046 (A, B, BM, C, DS, F, G, GH, K, MICH, MIN, MO, MSC, NY, P, POM, TEX, UC, US, WIS); San Rafael, Municipio of Tlamanalco, behind the paper factory, Jiménez s.n. MSC217564 (MSC); Cerro de Venacho, Valley of Mexico, Matuda 18800 (NY); Dinamo de Contreras, Valley of Mexico, Matuda 18675 (NY); Ozumba, Valley of Mexico, Matuda 25839 (NY, US); Cerro of the pines, Valley de Bravo, Matuda 27346 (NY); along brooks, Mt. Ixtaccihuatl, Purpus 18 (GH, MO, POM, UC, US); open woods and hillsides, Mt. Ixtaccihuatl, Purpus 1499 (BM, F, GH, MO, NY, P, POM, UC, US); 3 km southwest of Mesón Viejo, Municipio of Temascaltepec, Rzedowski 21690 (DS, MICH, MSC, TEX). State of Morelos: Huichilac-Cuernavaca, Juzepczuk 820 (US); Valley de Tepeite, Lyonnet 1482 (US). State of Oaxaca: between Llano Grande and Pinotepa, Nelson 2336 (GH, US).

21. ARCHIBACCHARIS SCHIEDEANA (Benth.) J. D. Jackson, Phytologia 28(3): 297. 1974. Baccharis scandens Less., Linnaea 5: 146. 1830. Not Pers. 1807. Baccharis Schiedeana Benth. in Oerst. Nat. For. Kjöbenhavn Vid. Medd. 1852: 83. 1852. Type: B, destroyed (D. E. Meyer, per. comm.). Lectotype: MEXICO: State of Vera Cruz: Jalapa, Aug., no year cited, Schiede 318 (GH!; photo. MIN!).

Baccharis elegans var. Seemannii Schultz Bip., Seem. Bot. Voy. Herald: 303. 1856. Type: MEXICO: Sierra Madre, N. W. Mexico, Seemann 2015 (K!; photo. MIN!; isotypes: GH! K!).

Baccharis Thomasii Klatt, Abh. Naturf. Ges. Halle 15: 326. 1881. Type: MEXICO: State of Vera Cruz: Orizaba, 1866, Thomas s.n. (P!; photo. MIN!).

Hemibaccharis torquis Blake, Contr. U. S. Nat. Herb. 20: 550. pl. 51. 1924. Archibaccharis torquis Blake, ibid. 23: 1508. 1926. Type: COSTA RICA: Prov. of San José: "hospice des alienes," San José, November 1892, Tonduz 1535 (US!; photo. MIN! UC!; isotypes: F! G! GH! NY! P!).

Scandent vines; ca. 20-100 dm tall; pubescence whitish or sordid; roots fibrous. Stems fractiflex, terete but the older portions sulcate between striations and hollow, lacking pith, the bases 0.3-1.0 cm in diam., stout, the internodes 0.8-8.0 cm long, dull, gray, green or brown below, gray-green or brown above, glabrescent below, persistently pilosulous or puberulous above. Leaves with petioles 1.0-11.0 mm long, pilosulous; blades mostly ovate, lance-ovate or rarely elliptical, 2.5-10.5 cm long, 1.0-5.5 cm wide, submembranaceous or thinly chartaceous, cuneate-rounded or cuneate to subobtuse at bases, acute to acuminate at apices, margins distally serrate to rarely entire, the upper surfaces dark-green, usually dull, evenly but thinly pilosulous and with scattered superficial whitish or amber glands, rarely subglabrous, the lower surfaces duller and lighter green and evenly pilosulous with scattered superficial glands. Panicles small and rounded, sometimes cymose, on pilosulous or puberulous peduncles. Pistillate Heads: 4.0-5.5 mm high, 2.5-3.5 mm wide, phyllaries 5(-6) seriate, acute, the outer ones lanceolate

and pilosulous, the inner ones lanceolate and glabrous; filiform ray flowers (17-)28-30(-50), pappus 2.0-3.1 mm long, brown-tinged, corollas short, 1.1-2.0 mm long, cream, whitish, green-white or green-white becoming purple at maturity, sparsely puberulous above, the ligules, if present, 0.1-0.5 mm long, achenes 1.0-1.3 mm long, 2-3(-5) nerved, shiny and hispidulous; disk flowers 1-3, pappus 2.4-3.8 mm long, corollas 3.0-4.0 mm long, anthers sterile, achenes inane. Staminate Heads: 6.0 (-7.0) mm high, 2.5-3.5 mm wide, phyllaries ca. 5-seriate; filiform ray flowers rarely present, reduced but apparently with fertile achenes; disk flowers 7-23, cream, whitish, green-white or green-white becoming purple at maturity, pappus 2.3-4.0 mm long, brown-tinged, tubes 1.3-2.7 mm long, puberulous above, limb 2.0-3.4 mm long, puberulous below, lobes linear, 1.4-2.7 mm long, the dorsal surfaces glabrous or sparsely puberulous near the apices, style branches oblong or linear, acute, achenes abortive, reduced to small knobs.

Chromosome number: 2n = 18 (Jackson, 1969); n = 9 (Solbrig et al., 1969).

Pollen diameters (microns): polar, 15.5-18.9; equatorial, 17.8-21.2; Jackson 1041, Smith P2045.

Floral illustrations: Fig. 29.

Vernacular names: "Cana cillo," (Dept. Chiquimula) "Culebrina" (Dept. Guatemala) and "Te Silvestre" (Dept. Retahuleu), Guatemala. Although no specimens from Honduras are known, the species may be expected there.

This species has been commonly confused with Archibaccharis hirtella var. hirtella. The two taxa may be separated by pubescence, the upper stems and branches of A. Schiedeana hairy but eglandular; A. hirtella var. hirtella puberulous with glandular hairs. The entire A. hirtella complex may be distinguished from A. Schiedeana by the shape of the style branches on the disk flowers: A. Schiedeana are always oblong or linear with acute apices and those of the A. hirtella complex are usually rhombic-oblong (at least not oblong or linear) with short acuminate apices.

On collector's labels, the habit of A. Schiedeana has been variously described as "shrub, vinelike, subscandent shrub, recurved shrub and tall herb." The author has studied populations in Mexico, Guatemala and El Salvador. In the early growth stages, the plant is weakly erect, without support, and has the appearance of a weak shrub or tall herb. In later stages, however, the plant is clearly a perennial woody vine, dependent for its support. No exceptions were seen.

The three binomials, Baccharis scandens Less., B. Schiedeana Benth. and B. Thomasii Klatt were erroneously included by Blake (1924, p. 549) in his list of synonymy under Hemibaccharis hirtella. That species was based on Baccharis hirtella DC. and as is indicated in the previous paragraph is distinct from A. Schiedeana. All these types were unknown to Blake except the isotype of B. scandens Less., examined in the Gray Herbarium (Blake, 1924, p. 549). Blake's (1926, p. 1508) Archibaccharis

torquis has similar characteristics and may now be referred to A. Schiedeana.

The name Baccharis Schiedeana was published by Bentham (1852). His intention was to rename B. scandens Less., a name he must have recognized as a later homonym for B. scandens (Ruiz. & Pavon) Pers., as he cited Lessing (1830). Article 32 of the International Code (Stafleu & Voss, 1972, p. 37) states a name is validly published when accompanied by "a reference (direct or indirect) to a previously and effectively published description or diagnosis of it." Thus, the epithet "Schiedeana" is regarded here as new and the oldest legitimate name. Two sheets of Oersted 61 (C) marked as "type of B. Schiedeana" represents the collection referred to only vaguely by Bentham when he listed the location. Article 7 of the International Code (1972, p. 19) states that "a new name or epithet published as an avowed substitute (nomen novum) for an older name is typified by the type of the older name." Therefore, the Oersted collection cannot typify the name B. Schiedeana. The type collection of B. scandens Less., Schiede 318, must also serve as the type of the epithet "Schiedeana" in its new combination in the genus Archibaccharis. Presumably the holotype of B. scandens was destroyed during World War II in Berlin where it was stored with other Compositae collections (Sleumer, 1949). According to Dr. D. E. Meyer (litt, July 1970) the holotype is not now in the Berlin-Dahlem Herbarium. A stem fragment of a pistillate plant bearing leaves and flowering heads (GH) has therefore been designated the lectotype.

Baccharis elegans var. Seemannii, which Blake (1924, p. 553 and 1926, p. 1509) from the original description regarded as doubtfully belonging to the genus Hemibaccharis may be typified. The holotype, Seemann 2015 (K) bears a note stating merely "Sierra Madre, N. W. Mexico." But reference to Seemann's Journal (1856) suggests the specimens may have been collected in the vicinity of Tepic, Nayarit. The general characteristics agree well with those of A. Schiedeana.

The type of Baccharis Thomasii was cited by Klatt (1881) as "DC. no. 134b." This specimen could not be located in the Prodromus Herbarium for the author. Possibly Klatt's number referred only to his chronological placement of the specimen before him within the Candolle number sequence. A specimen from the Drake Herbarium, Paris, determined as B. Thomasii by F. W. Klatt is undoubtedly the holotype. This is clearly A. Schiedeana.

From Nayarit and San Luis Potosi south to Chiapas, Mexico, Guatemala, El Salvador, Costa Rica and northern Panama (Fig. 28). Collected in moist forests and thickets, mostly along streams and on slopes, 600-3100 m ele.

COSTA RICA: Province of Alajuela: La Palma de San Ramón, Brenes 5824 (F); between Alajuela and Grecia, Brenes 17507 (F, NY); Volcán de Poas, Holway 366 (GH, MIN); Monte Aguacate, Oersted 61 (C, K, sketch GH); Zarcero, Smith H56 (F, MO); Zarcero, Canton Alfaro Ruiz, Smith P2045 (GH, UC). Province of

Cartago: Cartago, Oersted 10.988 (C); El Muneco on Río Navarro, Standley & Torres 51162 (US). Province of Heredia: north of Heredia, Brenes 13239 (F); between Poas and Barba volcanoes, Skutch 3444 (A, K, MO, NY, US). Province of San José: between Santiago and Pichacho Mondongo, Brenes 16958 (F); Guadeloupe near San José, Greenman & Greenman 5432 (MO); San José, Holway 253 (GH, MIN); near the mental hospital, San José, Pittier 1496 (GH); vicinity of La Verbena, Standley 32212 (GH, US); between San Pedro Montes de Oca and Curridabat, Standley 41288 (K, US); along Río Blanco, northeast of El Copey, Standley 41900 (US); vicinity of San Sebastian, south of San José, Standley 49318 (GH); San José, Tonduz 1549 (F, GH, K, P, NY, US). EL SALVADOR: Dept. Ahuachapán: near Ataco, Standley & Padilla 2661 (F); vicinity of Apaneca, Standley & Padilla 2998 (F). GUATEMALA: Dept: Alta Verapaz: Cobán, Jackson 1041 (B, BM, C, F, G, GH, K, MIN, MO, NY, P, US); between San Cristóbal Verapaz and Chixoy, Steyermark 43902 (F); Cobán, von Türckheim 1350 (F, G, GH, K, P, NY, US). Dept. Chimaltenango: between Chimaltenango and San Martín Jilotepeque, Standley 80898 (F). Dept. Chiquimula: Cerro Brujo, Steyermark 30937 (F). Dept. Guatemala: near Finca La Aurura, Aguilar 72 (F); Volcán Pacaya, Standley 58417 (F, MO); south of San Raimundo, Standley 62867 (F). Dept. Huehuetenango: east of San Rafael Pétzal, Standley 82861 (F, NY). Dept. Jalapa: between Jalapa and Paraíso, Standley 77314 (F); northwest of Jalapa, Standley 77509 (F, G). Dept. Jutiapa: Volcán Suchitán, Steyermark 31945 (F). Dept. Quezaltenango: Columba, Holway 826 (GH); Colomba, Skutch 1324 (A, F); Finca Helvetia, Skutch 1403 (A, F); near Calahuache, Standley 67121 (F, MICH); near El Muro, Standley 67167 (F, NY); Volcán Santa Maria, Steyermark 33549 (F). Dept. Quiché: Finca San Francisco, Skutch 1868 (A, F, NY, US). Dept. Retalhuleu: near Chivolandia, Standley 87211 (F); Puebla Nuevo, Stricker 228 (US). Dept. Sacatepéquez: Cuesta de las Canas, Standley 58857 (F, GH); near Antigua, Standley 61747 (F, GH). Dept. San Marcos: south of San Marcos toward Castalia, Williams, Molina & Williams 26176 (F, G). Dept. Santa Rosa: near El Molino, Standley 78383 (F). Dept. Suchitepéquez: Finca Mocá, Skutch 2118 (A, F, US). MEXICO: State of Chiapas: Chamula, Breedlove 7151 (DS, F, MICH); Rayón, Breedlove 11969 (DS, MICH); Chamula, Breedlove & Raven 13742 (MICH, NY); along Mexican Highway #195, 21 miles north of Highway #190, Jackson 1032 (A, B, BM, C, DS, F, G, GH, K, MICH, MIN, MO, MSC, NY, P, POM, TEX); Mt. Ovando, Jackson 1035 (F, GH, MIN, NY, US); Siltepec, Matuda S-39 (MICH, MO, US); Mt. Pasitar, Matuda 1544 (MICH). State of Guerrero: mountains west of Cerro Teotepec, Rzedowski & McVaugh 15 (MICH); along road to Taxco, Rzedowski 25226 (MSC). State of Hidalgo: Chapulhuacán, Kenoyer 733 (F, MO); around Palomas, Rzedowski 23339 (MICH, MSC, WIS); Chapulhuacán, Sharp 441767 (NY). State of Jalisco: Sierra de Manantlán, McVaugh 13880 (MICH); south of Talpa de Allende, McVaugh 21348 (MICH). State of Mexico: Nanchititla locality, Temascaltepec, Hinton 3089 (F, GH, K, MICH, MO, NY, US); northeast of Temascaltepec, Jackson 1049 (B, BM, C, F, G, GH, K, MICH, MIN, MO, MSC, NY, P,

Fig. 28. Distribution of Archibaccharis Schiedeana in Mexico and Central America.

UC, US). State of Morelos: above Cuernavaca, Pringle 9853 (F, GH, K, MO, NY). State of Nayarit: east of Jalcocotan, McVaugh 13339 (MICH); Tepic, Palmer 1846 (F, GH, NY, US). State of Oaxaca: Cerro de San Felipe, Conzatti 704 (GH); Oaxaca, Conzatti & González 44 (GH, US); valley of Oaxaca, Nelson 1471 (GH, US). State of Puebla: Huauchinango, Fröderström & Hultén 741 (F, NY). State of San Luis Potosi: Xilitla, Rzedowski 9984 (MICH, WIS). State of Vera Cruz: Orizaba, Bilimek 516 (K, P); Orizaba, Botteri 490 (F, K); Orizaba, Botteri 1144 (BM, G, K, P). Valley of Córdoba, Bourgeau 1637 (G, GH, K, P, US); Orizaba, Müller 264 (K, NY, P); Zacualpan, Purpus 2198 (UC); near Rancho Viejo, Purpus 14086 (A, F, MICH, US); near Jalapa, Rose & Hay 6132 (US); Orizaba, Schaffner 335 (P). PANAMA: Dept. Chiriquí: pastures around El Boquete, Pittier 2855 (C, GH, NY, P, US); Volcán Chiriquí, Terry 1363 (F, GH).

22. ARCHIBACCHARIS FLEXILIS Blake, Journ. Washington Acad. Sci. 17: 60. 1927. Hemibaccharis flexilis Blake, Contr. U. S. Nat. Herb. 20: 549. 1924. Type: GUATEMALA: Dept. Alta Verapaz: Cobán, 1350 m ele., February 1907, von Türckheim II 1636 (US!; photo. MIN!; isotypes: BM! C! F! GH! MICH! MO! NY! US!).

Scandent twining vines; ca. 40-80 dm tall; sordid-pilosulous or sordid-pilose; rhizomatous. Stems noticeably twisted, fractiflex only in the branches and branchlets, terete, the bases 2.5-8.0 mm in diam., graduating to 1.0-3.0 mm above, slender, the internodes 2.0-14.5 cm long, dull, brown, dark-brown or reddish on the older portions, the branchlets usually green, glabrescent below, pilose or pilosulous above. Leaves with petioles 2.0-15.0 mm long, pilosulous, blades elliptic, ovate-elliptic or lance-elliptic, 3.5-13.0 cm long, 1.5-4.5 cm wide, submembranaceous, rarely chartaceous, cuneate or narrowly obtuse at bases, acuminate at apices, margins distally serrate or serrulate, hispidulous, upper surfaces dark-green, shiny, sparsely pilosulous or subglabrous, the hairs stiff at their bases, lower surfaces dark-green, shiny but less so than the upper surfaces, sparsely pilosulous but usually denser than the upper surfaces. Panicles small, compact and convex on pilose or pilosulous peduncles. Pistillate Heads: 5.5-7.0 mm high, 2.5-3.5 mm wide, phyllaries 5-seriate, acute, the outer ones ovate, then linear-lanceolate, these usually sordid-puberulous, the inner ones chiefly linear and glabrous; filiform ray flowers 16-25, pappus 2.9-4.3 mm long, brown or yellow tinged, corollas 3.0-4.1 mm long, white, green-white, light-cream and sometimes with a suggestion of pink, glabrous above, then thickly puberulous bands above the middle, glabrous below, the ligules erect, variable in length from essentially lacking to 0.1-1.0 mm long, glabrous, achenes 1.1-1.7 mm long, (3-)5 nerves, dull, finely hispidulous; disk flowers 1-4, pappus 2.8-4.6 mm long, corollas 3.8-4.8 mm long, white, green-white, light-cream and sometimes with a suggestion of pink, anthers usually sterile but apparently sometimes partially functional, achenes inane. Staminate Heads: 5.0-7.5 mm high, 2.5-

3.5 mm wide, phyllaries 5-seriate; filiform ray flowers occurring sporadically, 0-8, pappus 2.7-3.0 mm long, brown or yellow-tinged, corollas 2.4-3.7 mm long, white, green-white, light-cream and sometimes with a suggestion of pink, achenes apparently fertile; disk flowers 10-21, white, green-white, light-cream and sometimes with a suggestion of pink, pappus 3.0-4.4 mm long, brown or yellow-tinged, tubes 1.4-2.9 mm long, puberulous above, limb 2.5-3.6 mm long, puberulous, lobes linear, 2.2-3.0 mm long, the dorsal surfaces puberulous, style branches usually linear, rarely oblong, acute, achenes abortive, inane or reduced to small knobs.

Chromosome number: n = 9 (Jackson, 1969).

Pollen diameters (microns): polar, 18.3-23.3; equatorial, 18.9-24.4; Williams, Molina & Williams 23702, Williams, Molina & Williams 26083.

Floral illustrations: Fig. 29.

Archibaccharis flexilis shares some vegetative characters with A. hirtella var. taeniotricha and some floral characters with A. Schiedeana.

A. flexilis is a tall vine which is found suspended high in the trees. This species is distinct from all other taxa of Archibaccharis with its brown, twining, twisted stems and thin, shiny leaves.

Reports of "arching shrubs" on collector's labels may indicate that A. flexilis can be found as a weak, erect plant without support in early growth stages, cf. discussion of A. Schiedeana. The author's collection, Jackson 1040, was found with the plants first prostrate, spreading rhizomatously on the forest floor. The plants rose sharply as scandent, twining vines high into the trees.

Jackson 1040 was collected when the plants were in the bud stage. The anther sacs in at least some of the disk flowers of the pistillate heads were found to be partially functional. Few anther sacs were available but a chromosome count was obtained. Good illustration of these chromosomes was not possible.

Known from Chiapas, Mexico through Guatemala, El Salvador, Nicaragua and Costa Rica (Fig. 30). This woody vine has been collected mostly in wet thickets and moist, cloud forests, 500-3000 m ele.

COSTA RICA: Province of Alajuela: Colinas de San Pedro de Ramón, Brenes 20333 (F, NY); upper limit of tropical zone, region of Zarcero, Smith H.13 (F, MO); Zapote, Smith H479 (F); Tapera de Zarcero, Smith NY1229 (F, GH, NY); Cerro del Esirito Sauto, Naranjo locality, Canton Naranjo, Smith P2411 (GH, K, UC). EL SALVADOR: Dept. Santa Ana: Cordillera Miramundo, mountain of Montecristo, Molina, Burger & Wallenta 16865 (F, GH). GUATEMALA: Dept. Alta Verapaz: .3 miles south of Cobán along road #17, Jackson 1040 (A, B, BM, C, DS, F, G, GH, K, MICH, MIN, MO, MSC, NY, P, POM, TEX, UC, US, WIS); near Cobán, Standley 69340 (F, GH); near San José, southeast of Tactic, Standley 69673 (F); Saquijá, 43 km northeast of Cobán, Standley 70201 (F); above Tamahú, Standley 70926 (F); Cobán, von Türckheim 854 (US); Cobán, von Türckheim 8405 (F, GH, K, NY, US). Dept. Chimaltenango:

Quisaché, Standley 62291 (F, MICH, NY). Dept. Quezaltenango: Finca Azucena, above Colomba, Standley 68019 (F); region of Las Nubes, south of San Martín Chile Verde, Standley 83617 (F); along road above Santa María de Jesús, Standley 84861 (F); along old road between Finca Pirineos and Patzulin, Standley 86836 (F). Dept. Sacatepéquez: hills of Finca Carmona, southeast of Antigua, Standley 63698 (F, GH, US); slopes of Volcán de Agua, above Santa María de Jesús, Standley 65058 (F). Dept. San Marcos: lower to middle slopes of Volcán Tajumulco, between Todos Santos and Finca El Porvenir, Steyermark 36998 (F); Volcán Tajumulco, between Finca La Patria and "Todos Santos Grande," Steyermark 37700 (F); on slopes of Cerro Tumbador, about 15 km west of San Marcos, Williams, Molina & Williams 23062 (NY); near Aldea Fraternidad, between San Rafael Pie de la Cuesta and Palo Gordo, Williams, Molina & Williams 26083 (NY). Dept. Suchitepéquez: south slope, Volcán Atitlán, Skutch 1482 (A, F, US); southern slopes of Volcán Zunil, vicinity of Finca Las Nubes, along Quebrada Chita, east of Pueblo Nuevo, Steyermark 35399 (F). MEXICO: State of Chiapas: Mt. Ovando, Matuda 2639 (GH, MICH, NY, US); Mt. Ovando, Matuda 4005 (MICH, NY); Mt. Ovando, Matuda 16235 (MO, US). NICARAGUA: Dept. Granada: forest on Mombacho Volcano, Williams & Molina 20049 (F, NY). Dept. Jinotega: Ocotillo near St. Lastenia, Cordillera Central de Nicaragua, Williams, Molina, Williams, Gibson & Laskowski 27840 (UC). Dept. Matagalpa: road to Aranjuez, Cordillera Central de Nicaragua, Williams & Molina 20146 (F, NY); between Disparate de Potter and Aranjuez, Cordillera Central de Nicaragua, Williams, Molina & Williams 23702 (GH, NY); near Jinotega Rock Quarry, 5 km north of Sta. Maria de Ostuma, Cordillera Central de Nicaragua between Matagalpa and Jinotega, Williams, Molina & Williams 23943 (GH, NY); about 6-10 km northeast of Matagalpa, road to El Tuma, Williams, Molina & Williams 24050 (BM); road to La Fundadora, north of Sta. Maria de Ostuma, Cordillera Central de Nicaragua, Williams, Molina & Williams 24896 (NY).

Excluded Names

The holotypes for the binomials listed below were personally studied by the author.

Archibaccharis prorepens Blake, Journ. Wash. Acad. Sci. 24: 432-433. 1934. This is Baccharis prorepens (Blake) J. D. Jackson, Taxon 19(2): 262-263. 1970.

Conyza Thesiifolia H.B.K., Nov. Gen. & Sp. 4: 75. 1820. This binomial was cited by Blake (1924, p. 554) as possibly belonging (from description) to Hemibaccharis. My examination of the holotype at the Paris Museum of Natural History indicated that this plant is actually a species of Conyza.

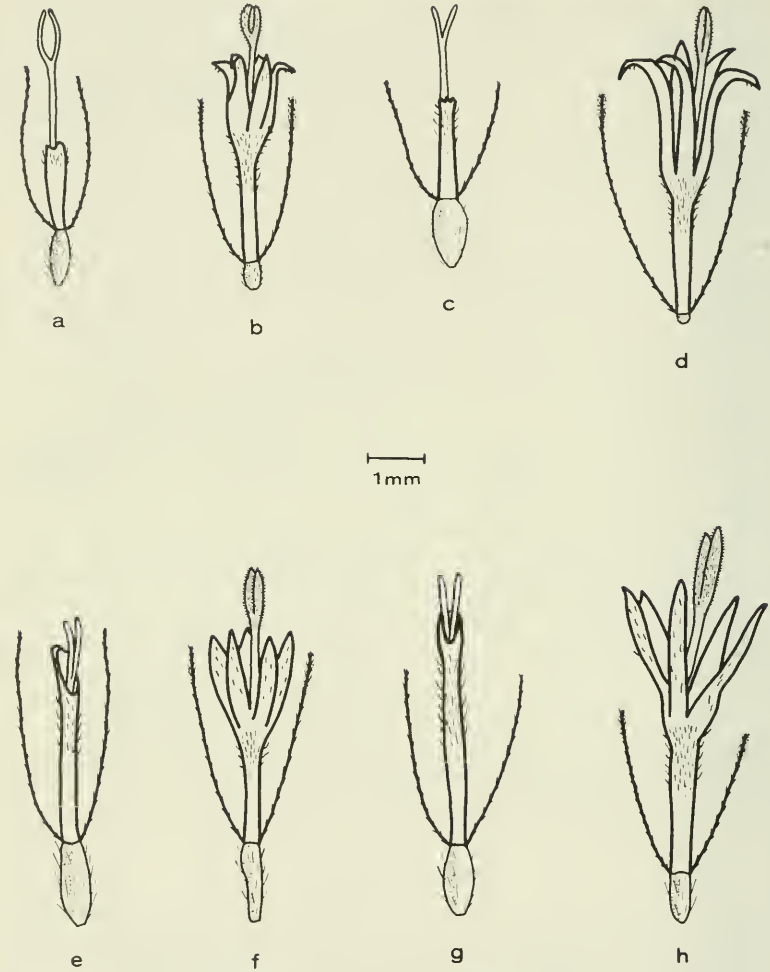

Fig. 29. Floral illustrations of *Archibaccharis Schiedeana* and *A. flexilis*. *A. Schiedeana*: (a, b) pistillate heads (*Tonduz 1535*): (a) filiform flower, (b) disk flower; staminate heads: (c) filiform flower (*Stricker 228*), (d) disk flower (Pittier & *Tonduz 1549*). *A. flexilis* (all from *von Türckheim II 1636*): (e, f) pistillate heads: (e) filiform flower, (f) disk flower; (g, h) staminate heads: (g) filiform flower, (h) disk flower. Disk flowers are shown without anthers.

Fig. 30. Distribution of Archibaccharis flexilis in Mexico and Central America.

Index to Exsiccate

This index lists all collections seen and classified during the preparation of this paper. A dash (___) appears where collection numbers were not available. Numbers in parentheses indicate the number of the taxon in this paper to which the collections were referred.

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ADDITIONAL NOTES ON THE GENUS CITHAREXYLUM. X

Harold N. Moldenke

CITHAREXYLUM SESSAEI D. Don

Additional bibliography: Moldenke, Fifth Summ. 1: 68, 430, 435, & 436 (1971) and 2: 787 & 860. 1971; El-Gazzar, Egypt. Journ. Bot. 17: 75 & 78. 1974; Moldenke, Phytologia 32: 74. 1975.

Additional citations: MEXICO: Michoacán: Hinton 15678 (Se—117444).

CITHAREXYLUM SHREVEI Moldenke

Additional bibliography: Moldenke, Phytologia 13: 313. 1966; Moldenke, Fifth Summ. 1: 68 (1971) and 2: 861. 1971.

CITHAREXYLUM SOLANACEUM Cham.

Additional & emended bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 550 (1893) and imp. 2, 1: 550. 1946; Rambo, Sellowia 7: 260 & 288. 1956; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 550. 1960; Angely, Fl. Anal. Paran., ed. 1, 578. 1965; Moldenke, Phytologia 13: 313. 1966; Reitz, Sellowia 22: 34. 1970; Angely, Fl. Anal. & Fitogeogr. S. Paulo, ed. 1, 4: 830 & iv. 1971; Moldenke, Fifth Summ. 1: 148, 357, & 436 (1971) and 2: 861. 1971; Moldenke, Phytologia 27: 161 (1973) and 32: 62. 1975.

The Angely (1971) reference in the bibliography of this species is sometimes cited as "1970", the title-page date, but was not actually published until 1971.

Recent collectors describe this species as a treelet or shrub, 2 m. tall, with fragrant flowers. The corollas are described as having been "white" on Hatschbach 17570 & 25611. The species has been found growing along roadsides and in secondary forests, flowering in October and fruiting in March.

Material has been misidentified and distributed in some herbaria as Aegiphila obducta Vell. or as Citharexylum glaziovii Moldenke. On the other hand, the Hatschbach 25760, distributed as C. solanaceum, is actually C. myrianthum Cham.

Additional citations: BRAZIL: Paraná: Hatschbach 17570 (Ft, W—2536539), 25611 (N, W—2706929); Hatschbach & Guimarães 20518 (Ac); Lindeman & Haas 533 (N); Reitz & Klein 17750 (N, W—2548338). Rio Grande do Sul: Rambo 54617 (B); Sehnem 7953 (B).

CITHAREXYLUM SOLANACEUM var. INSOLITUM Moldenke

Additional bibliography: Moldenke, Phytologia 7: 30—31. 1959; Moldenke, Fifth Summ. 1: 357 (1971) and 2: 861. 1971.

CITHAREXYLUM SOLANACEUM var. MACROCALYX Moldenke

Additional bibliography: Moldenke, Phytologia 13: 313. 1966; Moldenke, Fifth Summ. 1: 148 (1971) and 2: 961. 1971.

CITHAREXYLUM SPATHULATUM Moldenke & Lundell

Additional synonymy: Citharexylum brachyanthum glabrum Hitchc. & Moldenke ex Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1814, in syn. 1970.

Additional bibliography: Moldenke, Phytologia 13: 313. 1966; Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1814. 1970; Moldenke in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. Bot. 6:] 1337 & 1338. 1970; Moldenke, Fifth Summ. 1: 55 & 432 (1971) and 2: 569 & 861. 1971.

Recent collectors describe this plant as a slender openly branched shrub, 4 feet tall, the branches long, slender, flexible, and the fruit orange-red, globose, 6—7 mm. in diameter. They found it growing in brush on sandy plains and on gravel hills, fruiting in November. The fruits are sometimes inaccurately described as "berries", but actually are drupes. A popular name recorded for the species is "Mission fiddlewood".

Material has been misidentified and distributed in some herbaria as "Rhamnaceae". On the other hand, the Araiza 19, distributed as C. spathulatum, is actually C. brachyanthum (A. Gray) A. Gray.

Additional citations: TEXAS: Hidalgo Co.: Lundell & Lundell 12689 (Mi, N). Starr Co.: Lundell & Lundell 12676 (Mi, N); Rose & Russell 24364 (N).

CITHAREXYLUM SPINOSUM L.

Additional & emended synonymy: Citharexylum teres Jacq., Select. Stirp. Amer. Hist. 185, pl. 118. 1763. Citharexylum cinereum Jacq. ex J. F. Gmel. in L., Syst. Nat., ed. 13, imp. 1, 2: 942. 1789 [not C. cinereum Donn. Sm., 1907, nor L., 1763, nor Sessé & Moc., 1831, nor Spreng., 1893, nor Citharexylon cinereum L., 1851, nor Spreng., 1851]. Citharexylum laevigatum Hostm. ex Griseb., Fl. Brit. W. Ind. 497, in syn. 1861. Citharexylum quadrangulare Schau. apud Griseb., Fl. Brit. W. Ind. 497, in syn. 1861. Citharexylum cinereum "sensu Mayc." apud Gooding, Loveless, & Proctor, Fl. Barbados 356. 1965. Citharecylum quadrangulare Jacq. apud Uphof, Dict. Econ. Pl., ed. 2, 133, sphalm. 1968. Citharexylum cinereum Lam. apud López-Palacios, Revist. Fac. Farm. Univ. Los Andes 15: 21, in syn. 1975. Citharexylum sponosum L. ex López-Palacios, Revist. Fac. Farm. Univ. Los Andes 15: 15, sphalm. 1975.

Additional & emended bibliography: J. F. Gmel. in L., Syst. Nat., ed. 13, imp. 1, 2: 943 (1789) and ed. 13, imp. 2, 2: 943. 1796; Raeusch., Nom. Bot., ed. 3, 173. 1797; Desf., Tabl. École Bot., ed. 1, 54. 1804; Willd., Enum. Pl. Hort. Berol. 2: 650. 1809; Desf., Tabl. École Bot., ed. 2, 65. 1815; Pers., Sp. Pl. 3: 357. 1819; Vesque, Ann. Sci. Nat. Paris, ser. 7, 1: 340 & 341, pl. 15, fig. 6. 1885; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 549—550. 1893; Solered., Syst. Anat. Dicot. 712 & 716. 1899; D. H. Scott in Solered., Syst. Anat. Dicot., transl. Boodle & Fritsch, 1: 630 & 634. 1908; A. R. Northrop in J. L.

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Additional illustrations: Vesque, Ann. Sci. Nat. Paris, ser. 7, 1: pl. 15, fig. 6. 1885; Makins, Ident. Trees & Shrubs 89, fig. 77

C. 1936; Corner & Watanabe, Illustr. Guide Trop. Pl. 753. 1969; Kunkel, Arb. Exot. 1: 87. 1969; Little, Woodbury, & Wadsworth, Trees P. R. & Virg. Isls. 2 [U. S. Dept. Agr. Agric. Handb. 449]: 859, fig. 680. 1974; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 15: [fig. 2] (as "C. fruticosum"). 1975.

Recent collectors describe this plant as a shrub, 10 feet tall, or a small tree, 15—40 feet tall, the petioles orange, tan at the base, the flower-buds pinkish, the flowers small or "tiny" and sweetly fragrant, and the fruit orange, turning black. They have found it growing at the edge of mangrove swamps, on dry hillsides above the sea, in thickets at the edge of sea-cliffs, on dry shrub-covered slopes, and in seasonal secondary deciduous forests, at altitudes of 20—1550 feet, flowering in January, May, July, August, and November, and fruiting in January, July, August, and November. Wilbur and his associates refer to it as "a common tree" on Dominica. The corollas are described as "white" on all the flowering specimens cited below except on St. John s.n., where they are described as "pink".

In addition to the vernacular names previously reported by me, the following are also recorded: "arbre à cithare", "bellasombre", "bois-guitare", "bois-guitare quadrangulaire", "bois-guittare", "bois-guittare quadrangulaire", "cotlette", "nhői", "old-woman's-bitter", "totumo", and "white fiddle wood". It should be pointed out again that the many names applied to this species, and to other species in this genus, implying a use in the manufacture of fiddles or violins seem to be mis-applied. The original French indigenous name in the French West Indies seems to have been "bois fidèle", meaning a wood which can be relied on, but which was corrupted in English to "fiddle wood" and perpetuated in the scientific generic name, the recommended common name for the genus, and numerous vernacular appellations. Its Indochinese name, "nhői", according to Crevost & Petelot (1934), is applied there, again, because of its supposed (?) use in making musical instruments ["Bon pour la lutherie"].

Sykes speaks of the leaves of C. spinosum being "frosted" in New Zealand (North Island), by which statement he probably means that they are killed by unseasonable frosts, implying that the tree itself may survive temperatures leading to frosts.

Leaves on young sterile shoots are coarsely and irregularly few-toothed, as is well shown on Ruiz-Terán & López-Palacios 9891, on Moldenke, Moldenke, & Jayasuriya 28143, and in the excellent illustration by Crevost & Petelot (1934). This fact seems to be the basis for the plant being so widely misidentified in horticulture, especially in Asia and Africa, as C. subserratum Sw. [now known as C. fruticosum var. subserratum (Sw.) Moldenke]. Crevost & Petelot (1934) assert that it is "assez fréquent dans les jardines de Hanoi" [Vietnam]. Kunkel (1969) reports it as cultivated in several parks on Gran Canaria in the Canary Islands. Maheshwari (1963) describes it as a small tree, the "Leaves ovate, elliptic or lanceolate, glossy, tapering at [the] ends, subcoriaceous. Flowers white, fragrant, in long, drooping racemes.

Planted in the lawns or gardens along the side-lanes of New Delhi [India] and in hedges". He asserts that in India it is called "fiddle wood" and blooms from September to November. He cites Maheshwari 466. Srinivasan & Agarwal (1963) record it from Lahore, Punjab, and Khandala (Bombay). Puri and his associates (1964) speak of a C. subserratum as cultivated in India, but I suspect that they are here again referring to C. spinosum.

Harris (1965) reports C. spinosum from mixed evergreen deciduous forests on Antigua. Parker (1924) comments that the species is "Very variable in its habitat but not armed as the specific name suggests. Commonly grown in gardens in the plains [of Punjab] and usually called C. subserratum, Sw., which is a shrub from the West Indies. The wood is said to be specially suitable for making violins whence the generic and English names" (!) He notes that it flowers in Punjab from August to November. Gooding and his associates (1963) report finding it "in woods and gullies and widely cultivated" in the Barbados. My wife and I found it cultivated as a street tree in Honolulu, Hawaii, and as specimen trees in the Botanical Garden in Sri Lanka. Sivarajan notes that in Kerala it is "never seen in fruit, probably dioecious". Datta & Majumdar (1966) assert that in Bengal it flowers from May to June. Burkill (1966) affirms that it "has been cultivated for a number of years in the Botanic Gardens, Singapore, and grows satisfactorily" there. My wife and I did not see it on our recent visit to that garden.

Jafri & Ghafoor, in their as yet unpublished part of the Flora of Pakistan, affirm that this species was originally imported from the Barbados, cite Saida s.n. from a cultivated tree in Karachi, and assert that the species is "sometimes cultivated in our gardens for its scented flowers", blooming there from August to November. Again, my wife and I did not see it on our visit to Karachi. Raeuschel (1797) gives its native origin as "Martin[ique]".

Dinsmore reports that C. spinosum is "a fairly common but not abundant tree found throughout the island [Little Tobago] but never in thick stands or more than a few trees together. Grows to about fifty feet tall but most much shorter. Found in windswept areas as well as protected forest. Flowers shortly after the rains start at the end of [the] dry season in April, all the trees on the island flowering at approximately the same time. Flowers white. Fruit an orange berry [actually it is a drupe!], ripe in August, September and October. Fed on extensively by mockingbirds, thrushes and tanagers. Sheds leaves late in dry season." Uphof (1968) asserts that its wood is strong and reddish, used for general building purposes, windows, doors, and beams, and "for guitars by the natives".

Ruiz-Terán and López-Palacios describe what may be this species in Venezuela as an "árbol inerme, 8—10 m; tronco cilíndrico, tortuoso, 15-20 cm. de diámetro; copa amplia, muy irregular; hojas simples, opositidecusadas, verde intensas, lucientes por la haz, verde claras, sublucientes por el envés; drupas subma-

turas globoso-ovoides, lisas, lucientes, glabras; espécie moderadamente frecuente; alt. 100-450 m."

Löve (1968) reports the chromosome number as 2n = 76, based on Mehra & Gill 1177, cultivated in India. Scott (1908) reports that the development of the stomatal apparatus in C. spinosum is of the cruciferous type. Gibbs (1974) reports syringin absent from the stems of this plant and asserts that the HCl/methanol test gives only negative results.

Northrop (1910) misidentified that plant in the Bahamas as C. lucidum Cham. & Schlecht, of Mexico, based on her own collections, and gives this species the remarkable general distribution of "Andros, Cuba, Jamaica, Windward Islands, Mexico, Central America, and South America".

Seaver & Waterston (1940, 1942) describe the fungus, Ascospora citharexyli Seav. & Waterst., from dead leaves of C. spinosum in Bermuda. Its erumpent black perithecia are thickly scattered over both surfaces of the leaves. They also found Penzigia bermudensis growing abundantly on dead twigs of C. spinosum and Auricularia polytricha (Mont.) Sacc. on old stumps.

It should be noted here that the Angely (1971) reference in the bibliography above is sometimes cited as "1970", the title-page date, but was not actually published until 1971. The Mell & Mell 247, cited below, was erroneously cited by me in 1959 as C. macrophyllum Poir.

Gooding and his associates (1968) cite Herb. Barb. Mus. 227 & 228 from the Barbados islands.

Material of C. spinosum has been misidentified and distributed in many herbaria as C. subserratum Sw., C. fruticosum L., and even as Cordia sp. On the other hand, the Chippendale 23682, distributed as C. spinosum, is actually C. affine D. Don; Gastony, Jones, & Norris 427 is C. caudatum L.; A. A. Heller 4421 and C. R. Proctor 9506 are C. fruticosum L.; Täckholm & Elsayed s.n. [24/5/1962] is C. hidalgense Moldenke; Din s.n. [spring 1968] is C. montevidense (Spreng.) Moldenke; Hunger Filho s.n. [julho 1928] is C. myrianthum Cham.; and Batanouny s.n. and Täckholm & Elsayed s.n. [14/11/1961] are not verbenaceous. Little 26048 and Täckholm & Elsayed s.n. [22/11/1961] are a mixture of C. spinosum and something non-verbenaceous.

Additional citations: VIRGIN ISLANDS: St. Croix: Little 26048, in part (N, W—2690421). LEEWARD ISLANDS: Dominica: Gillis 8149 (Ft—9528); Nicolson 1883 (W—2468595), 1900 (W—2468594); Stern & Wasshausen 2436 (W—2566045); Wilbur, Dunn, Hespenheide, & Wiseman 7379 (W—2534420), 8236 (Au—272130, N, W—2579006), 8263 (W—2578999). WINDWARD ISLANDS: St. Lucia: G. R. Proctor 18123 (W—2584990); Sauer 4323 (Ws). St. Vincent: Sauer 4265 (Ws). TRINIDAD AND TOBAGO: Little Tobago: Dinsmore JJD.40 (Ws), JJD.47 (Ws). VENEZUELA: Falcón: Ruiz-Terán & López-Palacios 10231 (Ld).

[to be continued]

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BARK CHARACTERS OF SOME BAHAMA TREES AND SHRUBS

William T. Gillis
Department of Biology
Hope College
Holland, Michigan 49423

and

George R. Proctor
Science Museum
Institute of Jamaica
Kingston, Jamaica

During visits to the Bahama Islands and the Turks and Caicos Islands in pursuit of our work in revising the Bahama Flora, the authors have made collections of wood as well as herbarium specimens. These wood samples have been deposited in the Wood Laboratory at Harvard University. Herbarium voucher specimens for these wood samples have been deposited in the herbaria of the Arnold Arboretum and of the Institute of Jamaica.

Because of the diagnostic value of differing bark characteristics, we have felt that it would be useful to publish illustrations of some of the wood samples which we have deposited at Harvard to demonstrate these bark patterns. For a number of the species involved, this is undoubtedly the first occasion on which their woods have been placed on permanent file; moreover, this photographic record of the bark characteristics is also the first for a number of the included species.

Some of the bark patterns show a natural blotchiness; others are mottled due to the presence of undetermined crustose lichens. Nevertheless the general bark patterns -- smooth or furrowed, light or dark -- is apparent. All figures except No. 8 are to the same scale. The sample of *Piscidia piscipula* in Fig. 1 is two inches (5.1 cm) in diameter. The two samples in Fig. 8 are nearly three inches (7.5 cm) in diameter.

Of some interest is the difference in bark patterns among members of the same family: Fig. 1 shows (except for *Chrysophyllum*) members of the Leguminosae; Fig. 4 (with the exception of *Erythroxylum*) all Euphorbiaceae; the three specimens to the right in Fig. 6 (*Strumpfia, Erithalis,* and *Guettarda*) are all Rubiaceae. Nomenclature follows Britton and Millspaugh (1920) as modified by Gillis (1973 and 1974). The degree of hardness varied considerably among the samples. We made no attempt to measure this variation quantitatively. Qualitatively, however, it was evident that the

softest wood was that of *Calotropis procera*, the whole sawing process having been accomplished in four strokes of the saw. The hardest woods were those of *Suriana maritima* and *Krugiodendron ferreum*, the latter being known as "ironwood" in the Bahamas. Milky sap gushed from the cut surface of *Euphorbia gymnonota*, covering the saw and sawyer with its sticky effluvium.

We wish to acknowledge field assistance from Mr. George N. Avery and Mr. Errol Scott, and co-operation from Dr. Elizabeth Wheeler of the Harvard Wood Laboratory. Photographs were taken by Mr. John J. Lupo of the Harvard University Biological Laboratories.

We wish to acknowledge with appreciation a generous, anonymous grant to the Arnold Arboretum of Harvard University under which auspices the first author worked during this study. Further, we are indebted to a grant to us from the National Geographic Society for floristic and phytogeographic examination of the southern Bahamas and the Turks and Caicos Islands, under which auspices we traveled to the research site.

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TABLE 1 - COLLECTION DATA FOR SPECIMENS

Species	Family	Gillis Collection Number	Harvard Wood Laboratory No.	Origin
Aterammus lucidus	Euphorbiaceae	12089	29509	Inagua
Bontia daphnoides	Myoporaceae	12184	29505	Grand Turk
Bursera inaguensis	Burseraceae	12141	29511	Inagua
Byrsonima lucida	Malpighiaceae	12170	29521	Inagua
Calotropis procera	Asclepiadaceae	12274	29502	Grand Turk
Capparis cynophallophora	Capparaceae	12140	29534	Inagua
Chrysophyllum oliviforme	Sapotaceae	11983	29513	New Providence
Coccoloba uvifera	Polygonaceae	11976	29519	New Providence
Coccothrinax inaguensis	Palmae	12166	29520	Inagua
Conocarpus erectus	Combretaceae	11977	29531	New Providence
Cordia sebestena	Boraginaceae	12164	29526	Inagua
Crossopetalum rhacoma	Celastraceae	12120	29522	Inagua
Drypetes diversifolia	Euphorbiaceae	12084	29528	Inagua
Erithalis fruticosa	Rubiaceae	12121	29510	Inagua
Erythroxylum rotundifolium	Erythroxylaceae	12118	29508	Inagua
Euphorbia gymnonota	Euphorbiaceae	12086	29514	Inagua

Ficus elastica	Moraceae	11981	29500	New Providence
Gochnatia paucifloscula	Compositae	12143	29502	Inagua
Guapira discolor	Nyctaginaceae	12167	29524	Inagua
Guettarda krugii	Rubiaceae	12094	29504	Inagua
Krugiodendron ferreum	Rhamnaceae	12142	29515	Inagua
Leucaena leucocephala	Leguminosae	11980	29535	New Providence
Lysiloma bahamense	Leguminosae	11979	29536	New Providence
Lysiloma sabicu	Leguminosae	11986	29512	New Providence
Manilkara bahamensis	Sapotaceae	12159	29518	Inagua
Myrsine floridana	Myrsinaceae	12169	29506	Inagua
Nectandra coriacea	Lauraceae	11978	29516	New Providence
Phyllanthus epiphyllanthus	Euphorbiaceae	12206	29530	North Caicos
Pinus caribaea var. bahamensis	Pinaceae	12301	29501	Middle Caicos
Piscidia piscipula	Leguminosae	11984	29523	New Providence
Psidium guajava	Myrtaceae	11989	29533	New Providence
Psidium longipes var. orbiculare	Myrtaceae	12158	29525	Inagua
Reynosia septentrionalis	Rhamnaceae	11982	29527	New Providence

Strumpfia maritima	Rubiaceae	12149	29529	Inagua
Suriana maritima	Surianaceae	11888	29507	New Providence
Terminalia catappa	Combretaceae	11985	29517	New Providence
Zanthoxylum flavum	Rutaceae	12091	29532	Inagua

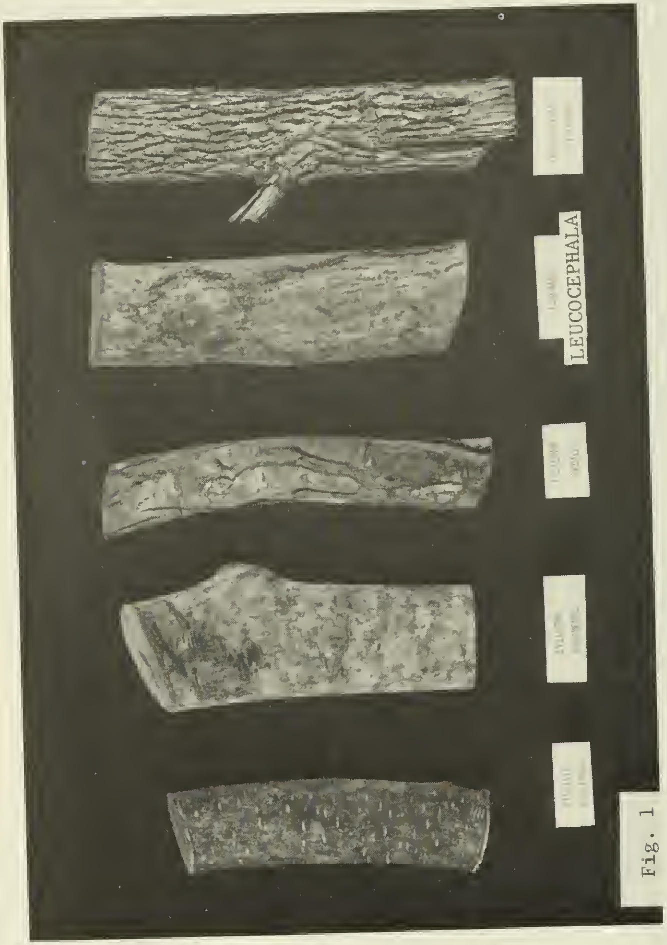

Fig. 1

Fig. 2

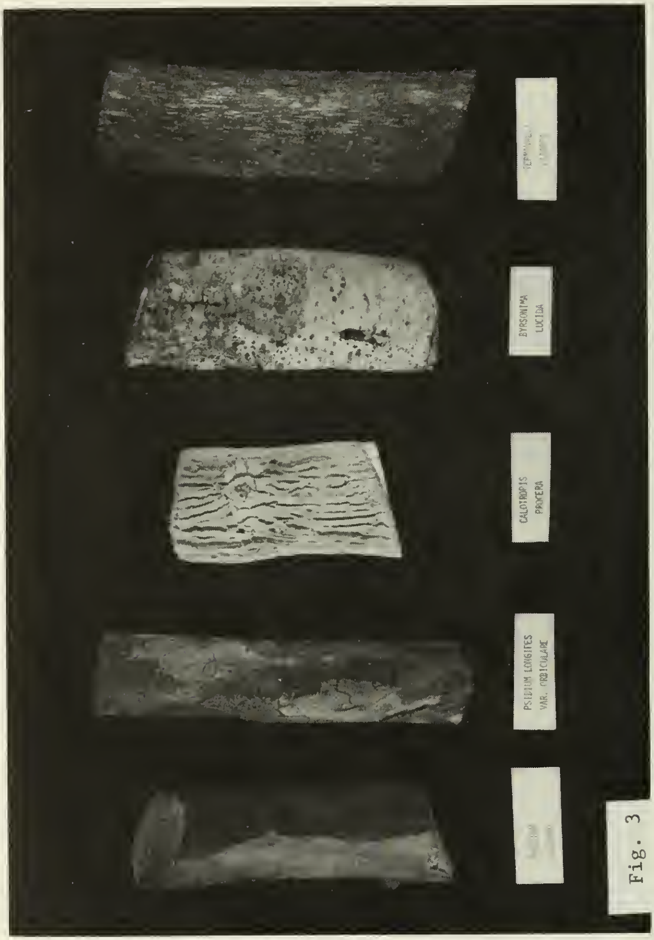
BYRSONIMA
LUCIDA
CALOTROPIS
PROCERA
PSIDIUM LONGIPES
VAR. ORBICULARE

Fig. 3

Fig. 4

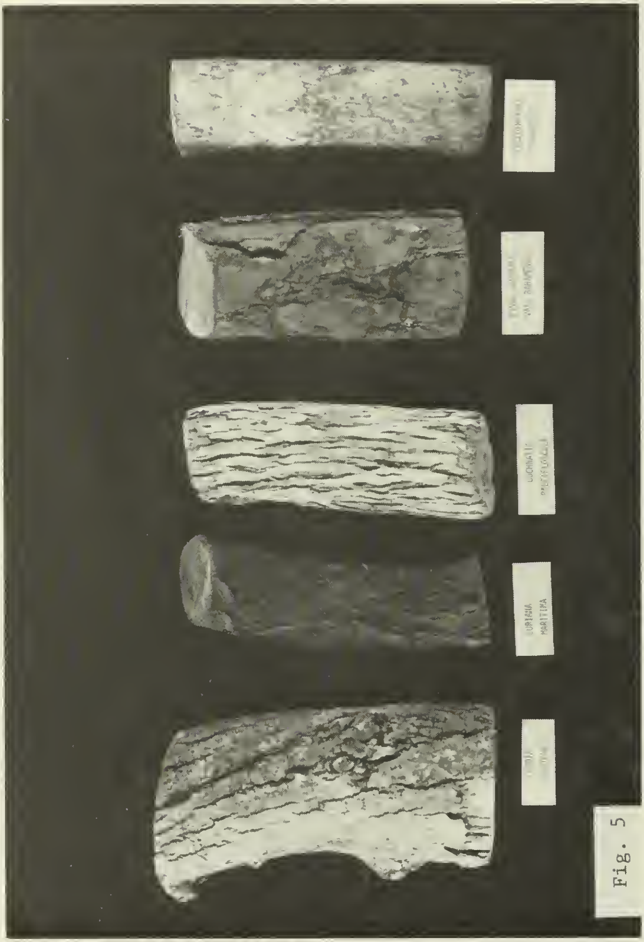

Fig. 5

Fig. 6

Fig. 7

Fig. 8

CYTOGEOGRAPHY OF DICENTRA EXIMIA (KER) TORR.

KINGSLEY R. STERN
Department of Biological Sciences, California State University,
Chico, California 95929

ABSTRACT

Determinations of chromosome numbers from 8 populations of *Dicentra eximia* (Ker) Torr. throughout its natural distribution are reported.

INTRODUCTION

The fumariaceous genus *Dicentra* Bernh. comprises some 20 species of herbaceous perennials and annuals, distributed throughout the north temperate zone in Asia, and eastern and western North America, primarily in mountainous regions (Stern, 1961; 1967). Best known among the North American representatives are the relatively small, early spring-flowering *D. cucullaria* and *D. canadensis*, the larger *D. eximia*, of the Appalachian region, and its western counterpart, *D. formosa*. *D. eximia* and *D. formosa* are well-known ornamentals, having been under cultivation in North America and Europe for more than 150 years. The two species appear to be closely related, and a number of artificial hybrids between certain forms of *D. formosa* and *D. eximia* have been produced (Stern and Ownbey, 1971). Self-incompatible clones of the two species cross freely when grown together, but the widely disjunct distributions preclude the likelihood of natural hybrids occurring, and none is known. Chemical and slight palynological differences between the two species have been demonstrated (Fahselt and Ownbey, 1968; Stern, 1962), and different chromosomal races of D. formosa have been identified (Stern, 1968). This study was undertaken to determine if similar chromosomal races occur in *D. eximia*.

MATERIALS AND METHODS

Live plants were obtained throughout the natural range of *D. eximia* in the Appalachian region during the summer of 1963. These were transported to the west coast and maintained under field conditions in Chico, California, and Pullman, Washington. Over several seasons, flower buds were harvested and fixed in a 3:1 mixture of 100% ethanol and 99% propionic acid, and stored, under refrigeration, in 50% ethanol. Chromosome counts were obtained from one to several buds taken from the transplanted specimens. All cytological observations reported here were made on propionocarmine squashes of microsporocytes. Slides were subsequently made permanent and have been retained by the author. Voucher specimens have been deposited in the Herbarium, University of California, Berkeley. The distribution map (Fig. 1) is adapted from Stern (1961), and is based on examination of some 300 herbarium specimens from approxi-

mately 50 herbaria, as well as on field studies. The latter indicate that numerous original localities of the species have now been lost to the encroachments of civilization. The large black dots superimposed on the overall distribution indicate the original locations of the live materials from which chromosome counts were obtained.

RESULTS AND DISCUSSION

The basic chromosome number for Dicentra appears to be x = 8, with a series of polyploids having been reported in the subgenus Dicentra, to which *D. eximia* belongs. (For a survey of chromosome numbers for the genus, see Stern, 1968; Stern and Ownbey, 1971). Bowden (1945) first reported the chromosome number for *D. eximia* as n = 8, based, evidently, on a specimen acquired from a nursery. *D. eximia* differs from *D. formosa* with regard to cytology in that no deviation from n = 8 apparently occurs throughout its natural distribution (Table 1). This affords little basis for conjecture about the possible evolution of the species. However, a synthesis of information available from gross morphology and anatomy, seed dispersal ecology, and chemistry, suggests the species occupies a position among the more primitive members of the genus (Berg, 1969; Fahselt and Ownbey, 1968; Stern, 1961).

ACKNOWLEDGEMENT

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VOUCHER SPECIMENS

MARYLAND: Allegany Co.: e bank Wills Crk. Gorge, vic. "The Narrows," W. Cumberland, Stern 2022. NORTH CAROLINA: Burke Co.: ravine below Wiseman's View, 4.6 mi s of Linville Falls P. O., Stern 2014. TENNESSEE: Polk Co.: Hiwassee R. Gorge, ca. 0.5 mi w of Reliance, Stern 2010. Sevier Co.: ca. 1 mi e of w boundary of GSMNP, Tenn. State Hwy. 73, Stern 2011. VIRGINIA: Bedford Co.: Sharptop trail, Peaks of Otter, Stern 2020. Augusta Co.: St. Mary's R. Valley, ca. 6 mi sse of Greenville, Stern 2021. Wythe Co.: 1.9 mi n and w of Sylvatus, Stern 2019W. WEST VIRGINIA: Randolph Co.: 2.6 mi e of entrance to Flatrock Wildlife Management Area, Monongahela Natl. Forest, Stern 2027.

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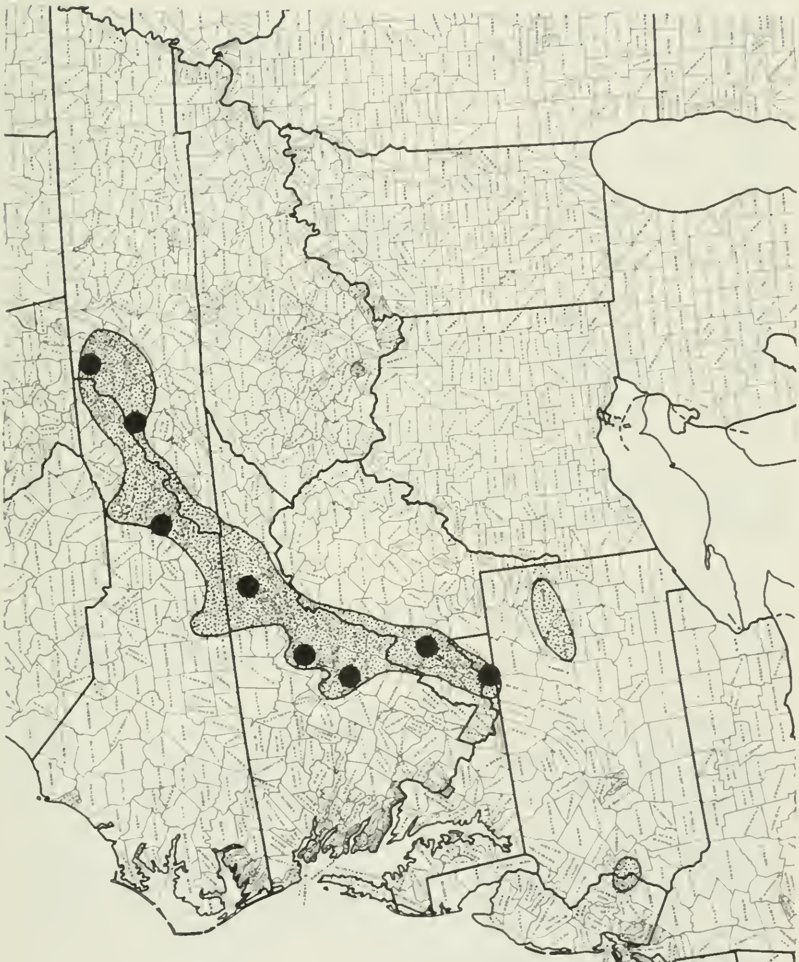
______, and M. Ownbey. 1971. Hybridization and cytotaxonomy of *Dicentra*. Amer. J. Bot. 58: 861-866.

TABLE 1.
Chromosome numbers in natural populations of *Dicentra eximia*

Collection	Chromosome No.	No. of counts
Stern 2010	$n = 8$	18
Stern 2011	$n = 8$	9
Stern 2014	$n = 8$	18
Stern 2019W (a white-flowered form)	$n = 8$	16
Stern 2020	$n = 8$	13
Stern 2021	$n = 8$	20
Stern 2022	$n = 8$	24
Stern 2027	$n = 8$	9

Fig. 1. Distribution of *Dicentra eximia*. Large black dots indicate populations from which chromosome counts have been obtained.



ADDITIONAL NOTES ON THE GENUS CITHAREXYLUM. XI

Harold N. Moldenke

CITHAREXYLUM SPINOSUM L.

Additional bibliography: Moldenke, Phytologia 32: 196--200. 1975.

Additional citations: VENEZUELA: Sucre: Ruiz-Terán & López-Palacios 9891 (Gz, Kh). GUYANA: Mell & Mell 247 (N, W--1481569). INDIA: Indore: Solanki s.n. [20.10.68] (Oa). Kerala: Sivarajan 1084 (Ld). CULTIVATED: Egypt: Collector undetermined s.n. [Nov. 1933] (Gz); Mahdi 14 (Gz, Gz), s.n. [13/4/1964] (Gz, Gz), s.n. [12/7/1964] (Gz, Gz, Gz); V. Täckholm s.n. [22/9/1959] (Gz), s.n. [2/11/1959] (Gz); Täckholm & Elsayed s.n. [22/11/1961], in part (Gz, Gz, Gz, Gz, Gz). Hawaiian Islands: Moldenke & Moldenke 28107 (Ac, Gz, Ld); R. P. Saint John s.n. [May 20, 1945] (Ba). India: Jarr s.n. [Oct. 1926] (Pd). New Zealand: W. R. Sykes 450/64 (Nz--149898). Pakistan: Qureshi s.n. [23.11.1965] (Kh, Kh, Kh). Singapore: Kiah S.174 (Ba); M. Shah MS.1230 [U. S. Pl. Introd. 75] (Ba). Sri Lanka: Herb. Roy. Bot. Gard. Perad. s.n. [April 1880; 11] (Pd), s.n. [April 1887; 11] (Pd), s.n. [River Drive, May 1894] (Pd), s.n. [seeds from S. Am.] (Pd); Moldenke, Moldenke, & Jayasuriya 28136 [E.275] (Gz, Pd, W--2764405), 28143 [E.229] (Ac, Pd. W--2764414).

CITHAREXYLUM STANDLEYI Moldenke

Additional & emended bibliography: Moldenke, Phytologia 4: 43 & 68 (1952) and 7: 46--47. 1959; Moldenke, Résumé 35, 46, & 447. 1959; Moldenke, Phytologia 13: 315. 1966; Moldenke, Fifth Summ. 1: 87 (1971) and 2: 861. 1971.

CITHAREXYLUM STANDLEYI var. MEXICANUM Moldenke

Additional bibliography: Moldenke, Phytologia 13: 315. 1966; Moldenke, Fifth Summ. 1 : 68 (1971) and 2: 861. 1971.

Additional citations: MEXICO: Colima: R. McVaugh 15551 (N).

CITHAREXYLUM STENOPHYLLUM Urb. & Ekm.

Additional bibliography: Fedde & Schust. in Just, Bot. Jahresber. 57 (2): 401. 1938; Moldenke, Phytologia 13: 315. 1966; Moldenke, Fifth Summ. 1: 102 (1971) and 2: 861. 1971.

CITHAREXYLUM STEYERMARKII Moldenke

Additional bibliography: Moldenke, Phytologia 13: 315. 1966; Gibson, Fieldiana Bot. 24 (9): 185 & 191. 1970; Moldenke, Fifth Summ. 1: 78 (1971) and 2: 861. 1971; Moldenke, Phytologia 23: 415. 1972.

Gibson (1970) cites only Steyermark 31433, the type collec-

tion, and comments that "It should be noted that the specimen from Zacapa, Steyermark 42845, is atypical. Although Moldenke previously identified it as C. crassifolium Greenm. the lower leaf surface is not densely pubescent, but is minutely and obscurely puberulent. Some of the leaves are three times as long as broad, as in C. caudatum L., but they are short-acuminate at the apex and the rachis of the inflorescence is puberulent as in C. steyermarkii. It may be that C. steyermarkii is only a glabrate form of C. crassifolium, or both may represent only a broad-leaved form of C. caudatum L."

CITHAREXYLUM SUBEROSUM Loes.

Additional bibliography: J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 670 & 680. 1960; Moldenke, Phytologia 13: 315. 1966; Moldenke, Fifth Summ. 1: 140 (1971) and 2: 861. 1971.

Macbride (1960) cites only the type collection from Apurímac, Peru.

CITHAREXYLUM SUBFLAVESCENS Blake

Additional synonymy: Citharexylum subflavescens H.B.K. ex Moldenke, Phytologia 26: 371, in syn. 1973. Citharexylum subflavescens Moldenke, Phytologia 31: 394, in syn. 1975.

Additional bibliography: Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14355. 1958; Moldenke, Phytologia 14: 511. 1967; Dwyer, Raymondiana 4: 70. 1971; Moldenke, Fifth Summ. 1: 115, 122, 357, 427, & 435—437 (1971) and 2: 861. 1971; Moldenke, Phytologia 28: 436 (1974), 31: 382, 384, 394, & 462 (1975), and 32: 49, 57, & 59. 1975; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 15: 16 & 21—22. 1975.

Recent collectors describe this species as a small tree, 5—22 m. tall, the trunk 25—80 cm. in diameter at breast height, the crown ample, the leaves opposite, without glands, dark-green and shiny above, yellow ferruginous-pubescent beneath, the calyx and fruiting-calyx light-green, and the fruit green or shiny-green when immature, turning dark-blue, purplish-red, red, or purple when mature. The corollas are described as "white" on Espinal T. & Ramos 3814 and Ferreyra & Acleto 15205, but as "yellow" on Garcia-Bariga 17535. It has been found growing in woods, on wooded slopes, and in "overcast vegetation on steep slopes at side of waterfall", at altitudes of 1020—2700 meters. Additional reported vernacular names for it are "cafesón" and "gavilán".

Ruiz-Terán & López-Palacios describe the species as an "Árbol erecto, inerme, perennifolio. Tronco cilíndrico. Corteza pardo-grisáceo-rosácea, ligeramente fisurada y escamosa. Hojas simples, opositidecusadas, coriáceas, verde intensas, lucientes, por la haz, densamente pardoamarillento-tomentosas por el envés. Racimos axilares, alargados, con flores hermafroditas muy fragrantes (a bazmín). Cáliz verde amarillento. Corola blanca. Drupas obovoideas, 12—15 cm. de diámetro, rojo esclaratas." Jiménez says "corteza viva formada de varias capitas de color a-

naranjado pálido y crema. Hojas opuestas con reborde estipular, de 30—35 cm. de largo y 10--12 cm. de ancho; con 15—17 pares de nervios laterales."

López-Palacios (1975) comments that "Ya se habló de la posible coespecificidad entre este taxon y el C. kunthianum. Las diferencias observadas en ejemplares de herbario no me convencen: el color del indumento (blanco sucio en C. kunthianum y oliváceo en C. subflavescens) y la presencia o ausencia de glándulas, no me perecen lo suficientemente constantes. Sin embargo, quédense las costas como están. Bernardi registra para un ejemplar de Mérida una altura de 30 m.........Los troncos de los ejemplares de Trujillo son los más gruesos del género que yo he visto en Venezuela (70—80 cm. de D.A.P.)"

Dwyer (1971) cites Woytkowski 8207 from Amazonas, Peru.

Material has been misidentified and distributed in some herbaria as Polyosma sp. On the other hand, the Barclay, Juajibioy, & Gama 3189, distributed as C. subflavescens, is the type collection of C. bullatum Moldenke.

Additional citations: COLOMBIA: Cauca: Espinal T. & Ramos 3814 (Ft). Cundinamarca: Barclay, Juajibioy, & Gama 3580 (W—2702103); Garcia-Barriga 13476 (N), 17535 (N); Idrobo & Hernández 1554 (N); Soejarto 346 (Oa). Valle del Cauca: Jiménez SAA.1856 (Ld). VENEZUELA: Aragua: Ruiz-Terán & López-Palacios 10180 (Ac). Federal District: Delgado 201 (W—1778780). Mérida: López-Palacios 3014 (Ld). Trujillo: Collector undesignated 10769 (Vi); Ruiz-Terán & López-Palacios 7616 (Ld). PERU: Amazonas: Ferreyra & Acleto 15205 (Ca—M251213).

CITHAREXYLUM SUBTHYRSOIDEUM Pittier

Additional synonymy: Aegiphila subthyrsoideum Pittier ex Moldenke, Phytologia 25: 235, in syn. 1973.

Additional bibliography: Pittier, Man. Pl. Usuel. Venez. 326 & 423. 1926; Fedde & Schust. in Just, Bot. Jahresber. 58 (2): 329. 1938; Hansford, Sydowia 10: 61. 1957; Hansford, Sydowia Ann. Myc., ser. 2, Beih. 2: 686. 1961; Moldenke, Phytologia 13: 316. 1966; Dennis, Kew Bull. Addit. Ser. 3: 258. 1970; Moldenke, Fifth Summ. 1: 115, 122, & 436 (1971) and 2: 861. 1971; Moldenke, Phytologia 25: 235 (1973) and 31: 345, 349, 382, & 461. 1975; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 15: 1, 11, & 22, [fig. 3]. 1975.

Illustrations: López-Palacios, Revist. Fac. Farm. Univ. Los Andes 15: [fig. 3]. 1975.

Recent collectors describe this plant as a vining shrub or a tree, 3.5—4 m. tall, the leaves firmly membranous, dull-green above and dull paler-green beneath, or dark-green on both surfaces, and the fruit "orange-olive-green". They have encountered it on dry reforested north-facing slopes, at altitudes of 500—900 m., flowering in June, and fruiting in August. The corollas are said to have been "greenish-yellow" on J. A. Steyermark 86308.

Dennis (1970) records the fungus, Asteridiella vilis var. caracasensis Hansf. from C. subthyrsoideum in Panama, but C. subthyrsoideum does not occur in Panama as far as I am aware. His "record" is apparently an erroneous transcription of Hansford's record of this fungus on C. caudatum L. in Panama [on Stevens 979], but Hansford also records it from Venezuela on the basis of Tamayo 2395.

López-Palacios (1975) comments that this is an "Arbolito bonito. Parece ser el único del género que no (me) ha dado problemas, pues hasta la fecha no ha sido confundido con ningún otro......Los ejemplares del Fendler han sido colocados tradicionalmente en Aragua a causa de un rótula impreso que Fendler agregó a sus exsicatas con la invariable leyenda 'Prope Coloniam Tovar'. Sin embargo, en GH existen 2 pliegos de este 842 en uno de los cuales se encuentra la citada leyende impresa, y en otro, en manuscrito: 'Valley of Macarao 3500 23/8 - 55 4/7 -56', indicación clara de dos colecciones en Macarao, una en 1855 y otra en 1856......Excluyo, pues, a Aragua y refiero el No 842 de Fendler a Macarao, em el Dro. Federal."

Additional & emended citations: VENEZUELA: Federal District: Fendler 842 (G, G, K); J. A. Steyermark 86308 (N). Lará: Steyermark, Delascio, Dunsterville, & Dunsterville 103643 (N, W—2621901). Yaracuy: H. M. Curran 216 (N).

CITHAREXYLUM SUBTRUNCATUM Moldenke

Additional bibliography: Moldenke, Phytologia 7: 55—56. 1959; Moldenke, Fifth Summ. 1: 148 (1971) and 2: 861. 1971.

CITHAREXYLUM SULCATUM Moldenke

Additional bibliography: Moldenke, Phytologia 13: 316. 1966; Acosta-Solis, Divis. Fitogeogr. Ecuad. 78. 1968; Moldenke, Fifth Summ. 1: 115 (1971) and 2: 861 & 968. 1971; Moldenke, Phytologia 22: 6. 1971; Hocking, Excerpt. Bot. A.21: 30. 1972; Moldenke, Biol. Abstr. 54: 6295. 1972.

Recent collectors describe this plant as a tree or large shrub, to 5 m. tall, the (immature) fruit green, tinged with purple, and have encountered it at the borders of pastures in the subpáramo, at 2700—2975 meters altitude, in fruit in May and November. Acosta-Solis (1968) records the vernacular name, "cogollo morado", and cites Acosta-Solis 6670 from Ecuador.

Additional citations: COLOMBIA: Cundinamarca: Barclay, Juajibioy, & Gama 3376 (W—2702205); Humbert, Idrobo, & Jaramillo 27577 (P).

CITHAREXYLUM SULCATUM var. HIRTELLUM Moldenke, Phytologia 22: 6. 1971.

Bibliography: Moldenke, Fifth Summ. 2: 861 & 968. 1971; Moldenke, Phytologia 22: 6. 1971; Hocking, Excerpt. Bot. A.21: 30. 1972; Moldenke, Biol. Abstr. 54: 6295. 1972.

Citations: COLOMBIA: Cauca: Espinal T. & Ramos 3284 (N—type).

CITHAREXYLUM SVENSONII Moldenke
Additional bibliography: Moldenke, Phytologia 7: 58—59. 1959; Moldenke, Fifth Summ. 1: 135 (1971) and 2: 861. 1971.

CITHAREXYLUM TECLENSE Standl.
Additional bibliography: Fedde & Schust. in Just, Bot. Jahresber. 58 (2): 329. 1938; Moldenke, Fifth Summ. 1: 84, 357, & 432 (1971) and 2: 861. 1971.

CITHAREXYLUM TERNATUM Moldenke
Additional bibliography: Moldenke, Phytologia 7: 60—61. 1959; Moldenke, Fifth Summ. 1: 95 & 427 (1971) and 2: 861. 1971; León & Alain, Fl. Cub., imp. 2, 2: 298 & 299. 1974.

CITHAREXYLUM TETRAMERUM T. S. Brandeg.
Additional bibliography: Moldenke, Phytologia 13: 316. 1966; Moldenke, Fifth Summ. 1: 68 (1971) and 2: 861. 1971.
The Gómez Pompa 961, distributed as C. tetramerum, is actually C. lycioides D. Don.

CITHAREXYLUM TRISTACHYUM Turcz.
Additional synonymy: Citharexylum cordatum Hort. ex Moldenke, Phytologia 26: 371, in syn. 1973 [not C. cordatum Stevens, 1961].
Additional & emended bibliography: Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 550 (1893) and imp. 2, 1: 550. 1946; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14355. 1958; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 550. 1960; Moldenke, Phytologia 14: 511. 1967; Hocking, Excerpt. Bot. A.13: 569. 1968; Moldenke, Biol. Abstr. 49: 2769. 1968; Moldenke, Fifth Summ. 1: 95, 100, 107, 357, 427, & 437 (1971) and 2: 861. 1971; C. D. Adams, Flow. Pl. Jamaic. 633 & 808. 1972; Alemán Frías, Aurich, Ezcurra Ferrer, Gutiérrez Vázquez, Horstmann, López Rendueles, Rodríguez Graquitena, Roquel Casabella, & Schreiber, Die Kulturpfl. 19: 422. 1972; Farnsworth, Pharmacog. Titles 8 (8): vi. 1973; León & Alain, Fl. Cuba, imp. 2, 299 & 301. 1974; Little, Woodbury, & Wadsworth, Trees P. R. & Virg. Isls. [U. S. Dept. Agr. Agric. Handb. 499:] 858 & 1000. 1974; Moldenke, Phytologia 31: 343, 380, 394, & 395 (1975) and 32: 51. 1975.
Recent collectors describe this plant as a small tree and have encountered it in thickets and on steep wooded hillsides, at altitudes of 1000—3000 feet, flowering in January and from July to October, fruiting in January and October. The corollas are said to have been "cream"-colored on Proctor 27582. Adams (1972) states that in Jamaica the species is "Local and uncommon.......on banks, mostly loose shale". Little and his associates (1974) exclude it from Puerto Rico and the Virgin Islands. Gillis 9849 was grown from seed secured in Cuba.
The C. cordatum of Stevens, referred to above, is a synonym

of C. caudatum L.

Adams (1972) cites from Jamaica: Adams 7729, Harris 6724, Jamaican Plants 1433, and Proctor 27582 and affirms that the species grows also in Cuba.

The León & Clément 6683, previously cited by me as C. tristachyum, is now the type collection of xC. leonis Moldenke, while Alain & Chrysogone A.1075, Clément 2849, W. Harris 6724, Hart 640, Hioram 4196, León 3914 & 14031, León & Clément 5437, León & José 4107, C. V. Morton 4083, C. R. Orcutt 3144, and Shafer 7937 & 12086 are C. tristachyum f. urbanii (O. E. Schulz) Moldenke.

Additional citations: CUBA: Oriente: León 12235 (W—2289342). JAMAICA: MacFadyen s.n. (Pd); G. R. Proctor 27582 (Mi, N); Yuncker 18324 (Bl—131160). CULTIVATED: Florida: Gillis 9849 [U. S. Pl. Introd. M-4661] (Ba); Woodbury & Buswell s.n. [August 13, 1946] (Ws).

CITHAREXYLUM TRISTACHYUM f. URBANII (O. E. Schulz) Moldenke, Phytologia 31: 25. 1975.

Synonymy: Citharexylum urbanii O. E. Schulz in Fedde, Repert. Nov. Sp. 5: 193—194. 1908. Citarexylum urbanii O. E. Schulz apud Alain in León & Alain, Fl. Cuba, imp. 1, 4: 301, in syn. 1957. Citharexylum urbani O. E. Schulz ex Moldenke, Résumé 259, in syn. 1959.

Bibliography: O. E. Schulz in Fedde, Repert. Nov. Sp. 5: 193—194. 1908; Prain, Ind. Kew. Suppl. 4, imp. 1, 49. 1913; Moldenke, Prelim. Alph. List Invalid Names 18. 1940; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 15. 1942; Moldenke, Alph. List Invalid Names 15. 1942; H. N. & A. L. Moldenke, Pl. Life 2: 87. 1948; Alain in León & Alain, Fl. Cuba, imp. 1, 4: 301. 1957; Prain, Ind. Kew. Suppl. 4, imp. 2, 49. 1958; Moldenke, Résumé 259. 1959; León & Alain, Fl. Cub., imp. 2, 2: 301. 1974; Moldenke, Phytologia 31: 25, 380, & 395. 1975.

Recent collectors describe this plant as a shrub or small tree, 6—15 feet tall, with orange-colored fruit, and have encountered it among limestone rocks, on limestone hills, and in "lime rock thickets", at altitudes of 300—600 meters, flowering from June to October, and fruiting in February, August, and November. The corollas are said to have been "white" on Shafer 7937.

All the specimens cited below were previously cited by me as typical C. tristachyum Turcz. The form differs, however, from the typical form of the species in having the lower surface of its leaf-blades more or less pilose-pubescent, sometimes quite densely so over the whole lower surface, but at other times apparently wearing off everywhere except along the midrib or in the vein-axils.

Citations: CUBA: Las Villas: León 14031 (Ha, N); León & Clément 5437 (Ha, N); León & José 4107 (Ha, N); C. V. Morton 4083

(W--1783452); Shafer 12086 (N, N). Oriente: Alain & Chrysogone A.1075 (N); Clément 2849 (Ha, N); Hioram 4196 (Ha, N, N); León 3914 (Ha, N); Shafer 7937 (N). JAMAICA: W. Harris 6724 (B—type, B--isotype, B--photo of type, E--photo of type, F—145894—isotype, F—185311—isotype, K--photo of type, N—isotype, N--isotype, N—photo of type, N—photo of isotype, S—photo of type, S--photo of isotype, W—photo of type, Z--photo of type, Z—photo of isotype); Hart 640 (F--393694, N, W—1323184); C. R. Orcutt 3144 (W—1478330).

CITHAREXYLUM ULEI Moldenke

Additional bibliography: J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 679. 1960; Moldenke, Phytologia 13: 317. 1966; Moldenke, Résumé Suppl. 17: 12. 1968; Moldenke, Fifth Summ. 1: 115, 140, & 148 (1971) and 2: 861. 1971.

Recent collectors describe this species as a tree, 8—10 m. tall, the corollas white, and the fruit red. They have encountered it at 740 m. altitude, flowering in April and fruiting in May.

Additional citations: PERU: Cuzco: Vargas C. 15338 (W—2446617). BRAZIL: Amazônas: Ducke 470 (E--1157546).

CITHAREXYLUM ULEI var. CALVESCENS Moldenke

Additional bibliography: Moldenke, Phytologia 13: 317. 1966; Moldenke, Fifth Summ. 1: 148 (1971) and 2: 861. 1971.

CITHAREXYLUM VALLENSE Moldenke

Additional bibliography: Moldenke, Phytologia 7: 68—69. 1959; Moldenke, Fifth Summ. 1: 115 (1971) and 2: 861. 1971.

CITHAREXYLUM VENEZUELENSE Moldenke

Synonymy: Citharexylum poeppigii f. anomalum Moldenke, Phytologia 8: 459. 1963. Citharexylum poeppigii f. anomala Moldenke apud López-Palacios, Revist. Fac. Farm. Univ. Los Andes 14: 21, sphalm. 1974.

Additional bibliography: Moldenke, Phytologia 7: 69--70 (1959), 8: 459 (1963), and 13: 302. 1966; Moldenke, Fifth Summ. 1: 122 (1971) and 2: 860 & 861. 1971; Moldenke, Phytologia 28: 436. 1974; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 14: 21 (1974) and 15: 11, 12, 17, 19, 20, & 22—24, [fig. 4]. 1975; Moldenke, Phytologia 21: 349, 382, & 394 (1975) and 32: 55 & 66. 1975.

Illustrations: López-Palacios, Revist. Fac. Farm. Univ. Los Andes 15: [fig. 4]. 1975.

Recent collectors describe this as a tree, 7—15 m. tall, with opposite or ternate leaves and with racemes axillary in the axils of the upper leaves and of the same number as the subtending leaves, at altitudes of 180—250 m., flowering in June, and fruiting in June and August.

López-Palacios says of this species: "Hojas siempre verdes (perennifolio?). Flores fragantes en antesis, sésiles o con pecíolos obsoletos, los que en fruto llegan hasta 1 mm. Inflor-

escencias paucifloras. Fruto apiculado, verde cuando inmaturo, amarillo verdoso cuando maduro." He reduces C. poeppigii f. anomalum Moldenke to the synonymy of this taxon and this is probably correct. He found it to be "muy abundante también a lo largo de la carretera entre Punta de Piedra y Santo Domingo, Edos. Barinas y Táchira". His spelling of the form epithet as credited to me is erroneous (the generic name is neuter, not feminine) and his citation of the publication of it as being in volume "9" of Phytologia is also incorrect. Concerning it he says (1975): "He examinado la población del Llano venezolano y he encontrado que la llamada forma anomala aparece en los árboles en el lado por donde reciben el viento! Simplemente las flores expuestas al viento del Llano, que en épocas es muy fuerte, se alargan y se aplanan hasta el punto de hacerlas aparecer diferentes a las del otro lado, que conservan la forma típica.

"Por lo expuesto rechazo esta forma y c eo que no tenga validez, ya que sería una inconsecuencia colocar la mitad un árbol en un taxon y la mitad restante en otro. Hay ejemplares de herbario en flor muy similares a C. macrophyllum....Aun el mismo Dr. Moldenke a veces ha dudado sobre su interpretación y yo llego a creer que bajo C. poeppigii f. anomala se han colocado especímenes de otras especies, como C. macrophyllum y C. venezuelense.

"Si estudiamos cuidadosamente la estrictura de los cálices, la nervadura, y el peculiar desprendimiento de los esterigmas de las hojas viegas, es a este último taxon (C. venezuelense) al que corresponde el tipo de C. poeppigii f. anomala, y allí lo coloco sinonímia."

He also reviews in detail the checkered history of López-Palacios 2924, 3156, & 3283. He finally compared these with the type of C. venezuelense in the Gray Herbarium (which he found to bear two labels, one asserting that it was collected at Colonia Tovar, and the other that it was collected "Cetus: Caracas & La Guaira"). He concludes that "Sin embargo, saqué en claro que el material por mí colectado era sin lugar a dudas coespecífico con el de Fendler, y también algún otro material que tanto el Dr. Moldenke como yo habíamos considerado que pertenecía a C. poeppigii f. anomala, a saber: Bernardi 2142, tipo de la forma acabada de citar (determinación del Dr. Moldenke) y Ruiz-Terán 1177 (determinación mía), que igualmente concuerdan con el tipo de C. venezuelense."

The vernacular name, "oreja de burro", has been recorded for C. venezuelense. Material has been misidentified and distributed in some herbaria as C. dryanderae Moldenke.

Additional citations: VENEZUELA: Apure: López-Palacios 2928 (Ac, Ld). Mérida: López-Palacios & Bautista 3283 (Ld). Táchira: López-Palacios 3156 (Ld, Z).

CITHAREXYLUM VIRIDE Moldenke

Additional bibliography: Moldenke, Phytologia 7: 70—71. 1959;

Moldenke, Résumé Suppl. 16: 3 & 4. 1968; Gibson, Fieldiana Bot. 24 (9): 189. 1970; Sáez T. & Nasser C., Revist. Biol. Trop. 18: 136. 1971; Farnsworth, Pharmacog. Titles 6 (9): iii. 1971; Moldenke, Fifth Summ. 1: 79, 87, & 90 (1971) and 2: 861. 1971; Farnsworth, Pharmacog. Titles 6, Cum. Gen. Ind. [31]. 1973; Moldenke in Woodson & Schery, Ann. Mo. Bot. Gard. 60: 93, 99--100, & 145. 1973; Moldenke, Phytologia 31: 346--348, 454, & 459 (1975) and 32: 70. 1975.

Recent collectors describe this species as an arborescent shrub or tree, 2.3--8 m. tall, the trunk 3--6 inches in diameter, the crown full and spreading, the leaves firmly membranous, rich-green above, paler-green beneath, the flowers sweet-scented, the calyx green, the corolla-lobes spreading, the fruiting-pedicels white, the fruiting-calyx light-green, and the fruit orange or bright-orange. The corolla is uniformly described as white (e.g., Cooper III.384, Skutch 4315, Steyermark 41825). Jiménez M. says of the fruit: "anaranjados primero, lurgo parde oscuro".

Collectors have encountered the plant in cacao plantations, clearings, forests, embankments on streamsides, the forested edges of creeks in tropical rainforests and moist secondary forests, in very moist habitats partly in the shade along roadsides, and "infrequent" in secondgrowth, at altitudes of sealevel to 1500 meters, flowering from December to April and in June, and fruiting in February, July, August, and December. The fruits are referred to as "berries" by Woodson & Schery, by actually are drupes. Skutch 4315 in the Missouri Botanical Garden herbarium exhibits one binary leaf.

The species is certainly very closely related to C. cooperi Standl. The two taxa may be distinguished as follows:

Leaf-blades subglabrate, pulverulent, or merely puberulent on the lamina beneath, more or less distichously short-pubescent only along the midrib. . . . . C. viride

Leaf-blades rather densely velutinous over the entire lower surface . . . . C. cooperi

Gibson (1970) comments that "A plant of Costa Rica and Panama, C. viride Moldenke, is very much like C. hexangulare and may prove synonymous with it. The type of C. viride, Cooper & Slater 157, from Panama, is a fruiting specimen, and the species was described without flowering material. Later collections of flowering material identified by Moldenke as C. viride differ from C. hexangulare only in their slightly broader calyces. Although the leaves of C. viride are described as densely puberulent beneath, leaves of the type specimens are essentially glabrous beneath and only very minutely pubescent along the lower part of the costae and in the axils of some veins."

Material of C. viride has been misidentified and distributed in some herbaria (and even cited by me in previous publications) as C. caudatum L., C. cooperi Standl., C. hirtellum Standl., and C. integerrimum (Kuntze) Moldenke. On the other hand, the Molina R., Williams, Burger, & Wallenta 17478, distributed as C. viride,

is actually C. hexangulare Greenm.

Additional citations: GUATEMALA: Izabal: J. A. Steyermark 41825 (N). COSTA RICA: Guanacaste: Brenes 12322 (N); Jiménez M. 1165 (W—2751901). San José: Molina R., Burger, Jiménez, & Wallenta 18045 (N); Skutch 4315 (E—1157067, N). PANAMA: Bocas del Toro: G. P. Cooper 384 (F—579254, F—579523, K, N, N—photo, W—1521573, W—1521580, Y—11975Y, Z—photo). Chiriquí: P. H. Allen 3661 (E—1572261, N, N); Cooper & Slater 201 (N); Dwyer & Hayden 7762 (E—1926253); P. White 223 (E—1190153); Woodson & Schery 755 (E—1204855, N). Province undetermined: Stork 42 [Western Panama] (Mi, W—1166830).

CITHAREXYLUM WEBERBAUERI Hayek

Additional synonymy: Citharexylum webercaueri Hayek apud Hocking, Excerpt. Bot. A.11: 504, sphalm. 1967.

Additional & emended bibliography: Prain, Ind. Kew. Suppl. 4, imp. 1, 49 (1913) and imp. 2, 49. 1958; J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 668, 671, & 680—681. 1960; Moldenke, Phytologia 13: 317. 1966; Hocking, Excerpt. Bot. A.11: 504. 1967; Moldenke, Biol. Abstr. 49: 4199. 1968; Moldenke, Résumé Suppl. 16: 19. 1968; Moldenke, Fifth Summ. 1: 140, 431, & 437 (1971) and 2: 861. 1971; Moldenke, Phytologia 31: 338. 1975.

Macbride (1960) cites only the type collection, Weberbauer 3731, from Huánuco, Peru, and comments that this plant is "A meter tall, resembling C. flexuosum but the leaves not rounded, the racemes few-flowered, the blossoms small.....; this as [=and] C. andinum Mold. may be genetically distinct but the problem is certainly open to question."

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ADDITIONAL NOTES ON THE GENUS PITRAEA. III

Harold N. Moldenke

PITRAEA Turcz., Bull. Soc. Imp. Nat. Mosc. 35 (2): 328—329. 1862.

Synonymy: Castelia Cav., Anal. Cienc. Nat. Madrid 3: 134, pl. 30, Icon. & Descr. 6: 60, pl. 583. 1801 [nom. rejic.; not Castelia Liebm., 1853, nor Castela Turp., 1806, nor Castellia Tin., 1817]. Cartelia Cav. apud C. Gay, Hist. Fis. Chile Bot. 5: 7, in syn. sphalm. 1849. Phelloderma Miers, Trans. Linn. Soc. Lond. Bot. 27: 100. 1870. Priva Juss. ex Miers, Trans. Linn. Soc. Lond. Bot. 27: 100, in syn. 1870 [not Priva Adans., 1763]. Bouchea Gay ex Miers, Trans. Linn. Soc. Lond. Bot. 27: 100, in syn. 1870 [not Bouchea Cham., 1832]. Bastelia Cav. ex Moldenke, Alph. List Cit. 4: 1088, sphalm. 1949.

Additional & emended bibliography: Pers., Sp. Pl. 3: 349. 1819; Spach, Hist. Nat. Veg. Phan. 9: 227. 1840; Walp., Repert. Bot. Syst. 4: 36. 1845; C. Gay, Hist. Fis. Chile Bot. 5: 7 & 25—27, fig. 1 (1849) and Atlas pl. 55. 1854; Hieron., Bol. Acad. Nat. Córdoba 4: 407. 1881; Voss in Vilm., Blumergärt. 1: 825. 1895; Rehnelt, Pareys Blumengärt., ed. 1, 277. 1932; Wangerin in Just, Bot. Jahresber. 54 (1): 1170 [366]. 1932; Parsa, Fl. Iran 4 (1): 534. 1949; Lanjouw, Internat. Code Bot. Nom., ed. 8, 248 & 282. 1956; Anon., Taxon 7: 119. 1958; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14358. 1958; Bullock, Taxon 7: 10. 1958; Rickett & Stafleu, Taxon 8: 301. 1959; J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 611 & 661—662. 1960; Caro, Kurtziana 1: 271—282. 1961; Burkart, Excerpt. Bot. A.5: 467. 1962; Hocking, Excerpt. Bot. A.5: 42 (1962) and A.6: 533. 1963; Melchior in Engl., Syllab. Pfl., ed. 12, 2: 437. 1964; F. A. Barkley, List Ord. Fam. Anthoph. 76 & 150. 1965; Chopra, Badhwa, & Ghosh, Poison. Pl. India 2: 694. 1965; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 7, 207, 862, 885, & 921. 1966; Lanjouw, Internat. Code Bot. Nom., ed. 10, 305 & 358. 1966; Moldenke, Phytologia 15: 41—42 (1967) and 16: 506. 1968; Moldenke, Biol. Abstr. 49: 1325 (1968) and 49 (3): S. 29 & S.73. 1968; Hocking, Excerpt. Bot. A.13: 569. 1968; Moldenke, Résumé Suppl. 16: 19. 1968; Anon., Torr. Bot. Club Ind. Am. Bot. Lit. 3: 305 & 308. 1969; Soukup, Raymondiana 3: 26 & 45. 1970; G. Taylor, Ind. Kew. Suppl. 14: 105. 1970; Heusser, Pollen & Spores Chile 82. 1971; Moldenke, Fifth Summ. 1: 5, 139, 147, 181, 191, 195, 356, 396, 398, 399, 422, & 424 (1971) and 2: 600, 603, 612, 614, 681, 688, 703, 755, & 857. 1971; Stafleu, Internat. Code Bot. Nom., ed. 11, 325 & 381. 1972; Thanikaimoni, Inst. Franç. Pond. Trav. Sect. Scient. & Techn. 12 (1): 187 & 258. 1972; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 8, 213, 885, & 908. 1973; Altschul, Drugs & Foods 245. 1973; Moldenke, Phytologia 26: 501 (1973) and 28: 454 & 507. 1974; Troncoso, Darwiniana 18: 296, 301, 302, 304, 361--364, 408, & 411, fig. 19 & 20. 1974; Moldenke, Phytologia 31: 384, 385, 387, 391—394, 406, 411, & 412. 1975.

The two previously issued numbers in this series of notes on this genus were entitled "Additional notes on the genus Castelia" (I in Phytologia 7: 368. 1961; II in Phytologia 15: 41—42. 1967). It is most unfortunate, in my opinion, that the International Code of Botanical Nomenclature (1956, 1972) has now legislated against the use of Castelia Cav. (1801) in favor of Pitraea Turcz. (1862), a name which will unquestionable very often be confused with Petrea Houst. which is often written as "Petraea". Troncoso (1974) comments in this connection: "Esta género fue originariamente descrito por Cavanilles, 1801 bajo el epíteto Castelia, nombre considerado como Nom. rejic. (cfr. Código Intern. Nom. Bot.: 249. 1956) por constituir un caso de homonimia con respecto a Castela Turpin (ambos nombres dados en homenaje a J. de Dios Castel)." Juan de Dios Castel was a Spanish companion of Loefling on his trip up the Orinoco River. Castela Turp., however, was not published until 1806, so if these names are to be considered homonyms, it is Turpin's which ought to be rejected! Castela Turp.

was published in Ann. Mus. Hist. Nat. Paris 7: 78 for a genus in the Simaroubaceae, the conserved type of which is C. depressa Turp.

It should be noted here that the Walpers (1845) reference cited in the bibliography above is often dated "1846", but pages 1—192 of this volume of the work were actually issued in 1845.

Troncoso (1974) also comments that "No he podido observar la capa de albumen señalado por Moldenke y Caro en las semillas de Pitraea. En semillas perfectamente maduras se diferencia netamente el embrión y el tegumento blando e incoloro que lo rodea, el cual parecería conservar una delgadísima capa de albumen residual aplicado al tegmen y formando parte del mismo. Este albumen residual que parece ser común en muchas familias (Belzung: 927. 1900), no puede tenerse en cuenta para señalarlo como carácter albuminoso de la semilla."

Macbride (1960) says that the genus "Differs from Priva especially in the thick hard merely rugulose pyrenes (Briquet) and in the (in part) verticillate flowers, tuberous roots (Moldenke) — Kobuski, following Briquet and Rusby, included it in Priva, which classification indicates its closest living affinity, but in floristic work it conveniently may be considered a separate entity; moreover, Moldenke listed (after Miers and others) 12 contrasting characters, notably the calyx not globosely dilated in fruit, corolla-tube veins straight, staminode present, nutlets joined in fruit."

Airy Shaw (1966) regards Pitraea as the valid name for the genus, but regards Phelloderma as a synonym of Priva Adans., a disposition which is entirely incorrect since Phelloderma is based on the same taxon as is Pitraea. In Phytologia 6: 234 (1958) the Greek words were inadvertently omitted in the derivation of the name Phelloderma. They are φελλος and δερμα.

PITRAEA CUNEATO-OVATA (Cav.) Caro, Kurtziana 1: 274. 1961.

Additional & emended synonymy: Castelia cuneato-ovata Cav., Anal. Cienc. Nat. Madrid 3: 134—135, pl. 30 & Icon. & Descr. Pl. 6: 60, pl. 583. 1801. Priva laevis A. L. Juss., Ann. Mus. Hist. Nat. Paris 7: 70. 1806. Verbena tuberosa R. Grah., N. Phil. Journ. 29: 174. 1840. Priva? orchioides Walp., Repert. Bot. Syst. 4: 36. 1845. Verbena lobelioides Grah. ex Walp., Repert. Bot. Syst. 4: 33, in syn. 1845. Verbena orchioides Walp., Repert. Bot. Syst. 4: 36, in syn. 1845. Verbena lobelioides Hort. ex Schau. in A. DC., Prodr. 11: 533. 1847. Bouchea copiapensis C. Gay, Hist. Fis. Chile Bot. 5: 26 & Atlas 1: pl. 55. 1849. Cartelia cuneato-ovata Cav. apud C. Gay, Hist. Fis. Chile Bot. 5: 7, sphalm. 1849. Pitraea chilensis Turcz., Bull. Soc. Imp. Nat. Mosc. 35 (2): 329. 1862. Bouchea copiapina Gay ex R. A. Phil., Anal. Univ. Chil. 35: 193. 1870. Phelloderma cuneato-ovata (Cav.) Miers, Trans. Linn. Soc. Lond. Bot. 27: 100.

1870. Castilleja cuneato ovata Cav. apud F. Phil., Cat. Pl. Vasc. Chil. 217, sphalm. 1881. Phelloderma cuneato-ovata Miers ex Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 493. 1894. Priva orchidoides Walp. ex Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 628, in syn. 1894. Castelia cuneo-ovata Cav. ex Voss in Vilm., Blumengärt. 1: 825, in syn. 1895. Verbena orchioides Hort. ex Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 1179. 1895. Verbena orchiodes Walp. ex Voss in Vilm., Blumengärt. 1: 825, in syn. 1895. Priva cuneato-ovata (Cav.) Rusby, Bull. Torrey Bot. Club 27: 80. 1900. Priva cuneato-ovatis (Cav.) Rusby apud Grenz., Ann. Mo. Bot. Gard. 13: 74. 1926. Priva cuneato-obovata (Cav.) Rusby apud Wangerin in Just, Bot. Jahresber. 54 (1): 1170, sphalm. 1932. Bouchea copiapensis Clos.-Phil. ex Moldenke, Prelim. Alph. List Invalid Names 7, in syn. 1940. Bastelia cuneato-ovata Cav. ex Moldenke, Alph. List Cit. 4: 1088, sphalm. 1949. Castelia laevis Melchior in Engl., Syllab. Pflanzenfam., ed. 12, 2: 437. 1964.

Additional & emended bibliography: Pers., Sp. Pl. 3: 349. 1819; Walp., Repert. Bot. Syst. 4: 36. 1845; C. Gay, Hist. Fis. Chile 5: 25--27 (1849) and Atlas pl. 55. 1854; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 493. 1894; Voss in Vilm., Blumengärt. 1: 825. 1895; C. Gay, Hist. Fis. Chil. Bot. 5: 7 & 25--26, fig. 1. 1849; Reiche & Phil., Fl. Chil. 5: 304--305. 1910; Sturtevant, Notes Edible Pl., imp. 1, 454. 1919; Grenz., Ann. Mo. Bot. Gard. 13: 74 & 88. 1926; Wangerin in Just, Bot. Jahresber. 65 (1): 1170 [366]. 1932; Metcalfe & Chalk, Anat. Dicot. 1035 & 1040. 1950; Darlington & Wylie, Chrom. Atlas 324. 1956; Lanjouw, Internat. Code Bot. Nom., ed. 8, 249. 1956; Anon., Taxon 7: 119. 1958; Bullock, Taxon 7: 10. 1958; R. C. Foster, Contrib. Gray Herb. 184: 169. 1958; Rickett & Stafleu, Taxon 8: 301. 1959; J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 661--662. 1960; Caro, Kurtziana 1: 271--282. 1961; Burkart, Excerpt. Bot. A.5: 467. 1962; Hocking, Excerpt. Bot. A.5: 42 (1962) and A.6: 533. 1963; Melchior in Engl., Syllab. Pflanzenfam., ed. 12, 2: 437. 1964; Lanjouw, Internat. Code Bot. Nom., ed. 10, 305. 1966; Hocking, Excerpt. Bot. A.13: 569. 1968; Bolkh., Grif, Matvej., & Zakhar., Chrom. Numb. Flow. Pl. 714. 1969; Anon., Biores. Index 6: 6422. 1970; Feldman & Garcia, Plant Dis. Rep. 54: 722--723. 1970; G. Taylor, Ind. Kew. Suppl. 14: 105. 1970; Heusser, Pollen & Spores Chile 62, pl. 59-671. 1971; Moldenke, Fifth Summ. 1: 139, 147, 181, 191, 195, 356, 396, 399, & 424 (1971) and 2: 600, 603, 614, 681, 688, 703, & 857. 1971; Hedrick, Sturtevant Notes Edible Pl., imp. 2, 454. 1972; F. Perry, Fls. World 305 & 318. 1972; Stafleu, Internat. Code Bot. Nom., ed. 11, 325. 1972; Altschul, Drugs & Foods 245. 1973; Rouleau, Taxon Index Vols. 1-20, part 1: 73. 1973; Troncoso, Darwiniana 18: 361--364 & 411, fig. 19 & 20. 1974; Moldenke, Phytologia 28: 454 (1974) and 31: 384, 385, 387, 391--394, 406, 411, & 412. 1975.

Additional illustrations: Caro, Kurtziana 1: fig. 1. 1961;

Heusser, Pollen & Spores Chile pl. 59-671. 1971; Troncoso, Darwiniana 18: 362 & 363, fig. 19 & 20. 1974.

Troncoso (1974) says of this plant's natural geographic distribution: "América templada: Perú, Chile, Bolivia y Argentina. en la Argentina ocupa el centro, norte y noroeste del país." She cites Venturi 8594 from Jujuy, H. H. Bartlett 19370 from Mendoza, and Ragonese 2270 from Santa Fe, Argentina, all deposited in the San Isidro herbarium, M. Cárdenas 3712 from Potosí, Bolivia, and H. H. Rusby 2531 from Tacna and Pfister 9360 from Antofagasta, Chile. She comments that "Según algunos coleccionistas (Eyerdam, in sched.) los tubérculos son comestibles. Ciertos autores le señalan propiedades medicinales (Domínguez: 212. 1905). Ha sido registrada como planta invasora y en Chile se la considera maleza (cfr. Caro: 280. 1961)." Altschul (1973) also reports the tubers edible, based on Eyerdam 24646. Feldman & Gracia (1970) report the plant as host to the alfalfa mosaic virus. Covas & Schnack (1946) report the chromosome number as 24, but Darlington & Wylie (1956) report the number as 44.

Heusser (1971) describes the pollen as "Monad, isopolar, radiosymmetric; tricolporate, colpi lengthy, narrow, constricted at the equator, pore area poorly defined, bulging somewhat; subprolate-prolate, amb subtriangular; exine ca 1.5 μ thick, clearly tectate, more or less psilate; 43—60 x 34—48 μ" based on "G. Geisse, Illapel (Coquimbo), 1893, SGO 42505. Distribution: Province of Antofagasta—Santiago."

Gay (1849) says "Meyen encontró esta planta cerca de Copiapo" and "Esta planta muy escasa se cria en los lugares secos de la provincia de Copiapo". Macbride (1960) says "Tuber edible, white (Eyerdam) at the end of a long string of fibrous roots, the flowers fragrant (Balls); corolla white, the tube purplish (Metcalf)" and cites Scolnik 1032 from Ica and Eyerdam 24646, Metcalf 30350, Raimondi 1813, Rusby 2531, and Shepard 269 from Tacna, Peru, giving the overall distribution as "Chile; to Argentina".

Voss (1895) describes the plant as "Staude, 30-45 cm hoch; Blütezeit: August bis Herbst; Pflanze mit knolligem, kriechendem Erdstamm, kahl, mit endständigen Blütenähren; Blüten hellrosenrot, mit feinem Orangenduft. — Hübsche, unter leichter Schutzdecke in jedem besseren Gartenboden überwinternde und durch ihre knolligen Erdstämme leicht zu vermehrende Pflanze für sonnige Standorte in Landschaftsgärten. Anzucht aus Samen." According to Rehnelt (1932) the German common name for the plant is "glatte Priva".

Recent collectors describe this plant as a very hardy perennial herb, 25—50 cm. tall, erect, and have found it growing in cultivated ground at 1100 m. altitude. Zöllner describes it as a weed in fields in Tarapacá, Chile, while García refers to it as abundant in wet places in Santiago del Estero, Argentina. The corollas are said to have been "lilac" in color on Krapovickas & Cristóbal 20645, "white" on T. Meyer 3883 and Villafañe 1119, and "white to pinkish-white" on Eyerdam 24646. It has been found in anthesis from December to March.

Material has been misidentified and distributed in some herbaria as "Labiatae". The Herb. Inst. Miguel Lillo 98621 collection, at least insofar as the United States National Herbarium specimen of it is concerned, is a mixture with a species of Marsypianthes.

Additional citations: CHILE: Tacna: Eyerdam 24646 (Ba). Tarapacá: Zöllner 3071 (Ac). ARGENTINA: Catamarca: Brizuela 540 (Ms--34199), 947 (N); A. Reales 823 (N), 978 (N); Villafañe 1119 (N). Córdoba: Gutiérrez 116 (Tu--77309). Mendoza: Lourteig 937 [Herb. Inst. M. Lillo 114104] (N); Villafañe 990 (Au--121515). Salta: Krapovickas & Cristóbal 20645 (Ld); T. Meyer 3883 [Herb. Inst. Miguel Lillo 35686] (E--2655607). Santiago del Estero: Cuezzo 2337 (Au--121516); P. García 262 (N). MOUNTED CLIPPINGS: Miers, Trans. Linn. Soc. Lond. Bot. 27: 101. 1870 (W).

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ADDITIONAL NOTES ON THE GENUS CORNUTIA. III

Harold N. Moldenke

CORNUTIA Plum. ex L., Sp. Pl., ed. 1, imp. 1, 2: 628. 1753; Gen. Pl., ed. 5, 276. 1754 [not Cornutia Burm. f., 1768].

Additional & emended synonymy: Cornuta Plum. ex L., Gen. Pl., ed. 6, 316. 1764. Cornvtia Scop., Introd. Hist. Nat. 170 & 179. 1777. Hosta Jacq., Hort. Schoenbr. 1: 60, pl. 114. 1797 [not Hosta Pfeiff., 1966, nor Tratt., 1814, nor Vell., 1874]. Cornutia [Plum. ex L.] L. apud Dalla Torre & Harms, Gen. Siphonog., imp. 1, 432. 1904.

Additional & emended bibliography: L., Crit. Bot. 92 & [280]. 1737; L., Gen. Pl., ed. 1, 24, 25, 366, [385], & [390]. 1737; L., Meth. Sex. Gen. Pl. 15, 92, & [280]. 1737; L., Gen. Pl., ed. 2, 303 & [535] (1742), ed. 3 ["2"], 233 & [419] (1743), and ed. 4, 233 & [448]. 1752; L., Sp. Pl., ed. 1, imp. 1, 2: 628. 1753; L., Gen. Pl., ed. 5, imp. 1, 276 & [501]. 1754; Adans., Fam. Pl. 2: 12, 196, & 199. 1763; L., Gen. Pl., ed. 6, 316 & [587]. 1764; [Retz.], Nom. Bot. 154 & [284]. 1772; Planer, Gatt. Pfl. 2: 557 & 1057. 1775; Scop., Introd. Hist. Nat. 170 & 179. 1777; Reichard in L., Gen. Pl., ed. 8, 318. 1778; J. F. Gmel. in L., Syst. Nat., ed. 13, imp. 1, 2: 890 & 946. 1789; Haenke in L., Gen. Pl., ed. 10 ["8"], 2: 554 & 794. 1791; Schreb. in L., Gen. Pl., ed. 9 ["8"], 2: 414--415 & 849. 1791; J. F. Gmel. in L., Syst. Nat., ed. 13, imp. 2, 2: 890 & 946. 1796; Raeusch., Nom. Bot., ed. 3, 173 & 383. 1797; Batsch, Tabl. Aff. Reg. Veg. 193. 1802; Desf., Tabl. École Bot., ed. 1, 54. 1804; Willd., Enum. Pl. Hort. Berol. 2: 652. 1809; Desf., Tabl. École Bot., ed. 2, 64. 1815; H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 200--201 (1817) and ed. quarto, 2: 247--248. 1818; Pers., Sp. Pl. 3: 358--359. 1819; J. E. Sm., Gramm. Bot. 98 & 223. 1821;

Endl., Gen. Pl. 635 & 638. 1838; Spach, Hist. Nat. Veg. Phan. 9: 227. 1840; Voigt, Hort. Suburb. Calc. 473. 1845; W. Griff., Notul. 4: 173. 1854; Schnitzlein, Icon. Fam. Nat. 2: 137 Verbenac. [2] & [3]. 1856; Ettinsh., Blatt-Skel. Dikot. pl. 32, fig. 8. 1861; Pfeiff., Nom. Bot. 1: 1671. 1874; Barnhart, Bull. Torrey Bot. Club 29: 590. 1902; Dalla Torre & Harms, Gen. Siphonog., imp. 1, 432. 1904; L., Sp. Pl., ed. 1, imp. 2 & 3, 2: 628. 1907; Solered., Syst. Anat. Dicot. Ergänz. 255. 1908; Goyena, Fl. Nicarag. 1: 568. 1911; E. D. Merr., Philip. Journ. Sci. 19: 376 & 377. 1921; Wangerin in Just, Bot. Jahresber. 53 (2): 645. 1925; Benoist, Arch. Bot. Caen 5, Mem. 1: 258. 1931; Stapf, Ind. Lond. 6: 479. 1931; Benoist, Bois Guyan. Franç. 258. 1933; L., Sp. Pl., ed. 1, imp. 4, 2: 628. 1934; Moldenke, Brittonia 1: 260 & 471. 1934; Fletcher, Kew Bull. Misc. Inf. 1938: 434. 1938; Moldenke, Prelim. Alph. List Invalid Names [1], 4, 10, 14, 23, 24, 27, & 28. 1940; Hill & Salisb., Ind. Kew. Suppl. 10: 61, 114, & 244. 1947; Metcalfe & Chalk, Anat. Dicot. 1035—1037 & 1041, fig. 248 G. 1950; Petelot, Pl. Méd. Cambod. Laos & Viet. 2 [Archiv, Recherch. Agron. & Past. Viet. 18]: 250. 1953; Anon., U. S. Dept. Agr. Bot. Subj. Index 15: 14356. 1958; Cuatrecasas, Revist. Acad. Colomb. Cienc. 10: 235. 1958; H. St. John, Nomencl. Pl. 123. 1958; L., Sp. Pl., ed. 1, imp. 5, 2: 628. 1959; L., Gen. Pl., ed. 5, imp. 2, [Cramer & Swann, Hist. Nat. Class. 3]: 276 & [501]. 1960; J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 611, 690, & 713. 1960; Hartl, Beitr. Biol. Pfl. 37: 293. 1962; Dalla Torre & Harms, Gen. Siphonog., imp. 2, 432. 1963; Melchior in Engl., Syllab. Pflanzenfam., ed. 12, 2: 435. 1964; F. A. Barkley, List Ord. Fam. Anthoph. 76, 155, & 174. 1965; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 7, 285 & 557. 1966; Fosberg & Klawe in Bowman, Galápagos 188. 1966; Gómez Pompa, Estud. Bot. Reg. Misantla 93. 1966; Anon., Biol. Abstr. 48 (14): B.A.S.I.C. B.8. 1967; Dandy, Reg. Veg. 51: [Ind. Gen. Vasc. Pl.] 42, 121, & 122. 1967; Hocking, Excerpt. Bot. A.12: 425—426. 1967; J. Jiménez, Archiv. Bot. & Biogeog. Ital. 43: 14. 1967; Moldenke, Phytologia 14: 420—429. 1967; Moldenke, Résumé Suppl. 15: 3, 15, & 20 (1967), 16: 4, 5, 20, 23, & 29 (1968), and 17: 8. 1968; Acosta-Solis, Divis. Fitogeogr. Ecuad. 63. 1968; Moldenke, Biol. Abstr. 49: 4199. 1968; Stearn, Humb. Bonpl. Kunth Trop. Am. Bot. 16. 1968; Uphof, Dict. Econ. Pl., ed. 2, 154 & 541. 1968; Anon., Torrey Bot. Club Ind. Am. Bot. Lit. 3: 306 & 308. 1969; Dandy, Taxon 18: 469. 1969; Moldenke, Phytologia 18: 505. 1969; Gibson, Fieldiana Bot. 24 (9): 179 & 195—198, fig. 37. 1970; Soukup, Raymondiana 3: 26 & 49. 1970; Angely, Fl. Anal. & Fitogeogr. Est. S. Paulo, ed. 1, 4 : 826. 1971; Balgooy, Blumea Suppl. 6: [Pl. Geogr. Pacif.] 200. 1971; Farnsworth, Pharmacog. Titles 6 (9): iii. 1971; Moldenke, Fifth Summ. 1: 5, 69, 79, 81, 83—85, 87, 89, 90, 92, 95, 100, 102, 105, 108, 110, 111, 116, 122, 123, 132, 133, 135, 140, 148, 361, 362, 378, 385, 420, & 469—471 (1971) and 2: 528—531, 533, 727, 758, 787, 875, & 876. 1971; Sáez R. & Nasser C., Revist. Biol. Trop. 18: 137. 1971; Moldenke, Phytologia 21: 102, 387, & 505 (1971), 22: 282 (1971), and 23: 319, 415, 430, 454, & 505. 1972;

C. D. Adams, Flow. Pl. Jam. 627, 636, & 811. 1972; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 8, 293 & 571. 1973; Altschul, Drugs & Foods 245—246 & 351. 1973; Anon., Biol. Abstr. 56 (3): B.A.S.I.C. S.59. 1973; López-Palacios, Pittiera 5: 18. 1973; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 9 (13): 18. 1973; Moldenke, Biol. Abstr. 56: 1243. 1973; Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 43, 125-130, & 145, fig. 13. 1973; Moldenke, Phytologia 25: 227, 238, & 505 (1973), 26: 502 (1973), 27: 507 (1974), and 28: 432, 435, 449, & 508. 1974; Hocking, Excerpt. Bot. A,23: 291. 1974; H. R., Biol. Abstr. 57: 1904. 1974; Lasser, Braun, & Steyerm., Act. Bot. Venez. 9: 36. 1974; León & Alain, Fl. Cuba, imp. 2, 2: 280 & 313—314, fig. 135. 1974; Little, Woodbury, & Wadsworth, Trees P. R. & Virg. Isls. 2 [U. S. Dept. Agr. Agric. Handb. 449]: xii, 854, 862, 863, 993—995, 997, 1001, 1004, 1007, 1012, 1014—1016, 1020, & 1023, fig. 682. 1974; Molina R., Ceiba 18: 66. 1974; J. F. Morton, 500 Pl. S. Fla. 63. 1974; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 15: 24 & 96. 1975; Moldenke, Phytologia 31: 239 & 378. 1975; Molina R., Ceiba 19: 95. 1975.

It should be noted that Cornutia Burm. and Cornutia Burm. f. are synonyms of Premna L., while Hosta Pfeiff, and Hosta Vell. are synonyms of Clavija Ruíz & Pav. in the Theophrastaceae (Myrsinaceae) and Hosta Tratt. is a valid conserved genus in the Convallariaceae. While Airy Shaw (1966) credits one of the Hosta homonyms to Pfeiffer, consultation of Pfeiffer's work (1874) shows that Pfeiffer plainly credits the name to Velloso's "Flora Fluminensis".

It is also worth recording here that the H.B.K. reference dates given in the above bibliography have been authenticated by Barnhart (1902). The Endlicher (1838) reference cited above is often cited as "1836-1856", but the pages involved here were actually issued in 1838. The Angely (1971) reference is sometimes cited as "1970", the title-page date, but the volume involved was not actually published until 1971.

Dalla Torre & Harms (1904) assert that the genus Cornutia comprised 4 or 5 species from tropical America only, while León & Alain (1974) raise the estimate to about 11. I recognize 26 valid taxa, 12 of which are of specific rank.

Macbride (1960) informs us that "Plumier's name [for the genus] (as decreed by modern savants, validated by Linnaeus) records the botanical observations of an early seventeenth century Canadian physician, Jacques Philippe Cornut" — actually Cornut was a French physician who traveled in Canada and wrote on Canadian plants.

CORNUTIA AUSTRALIS Moldenke in Fedde, Repert. Spec. Nov. 40: 171—172. 1936.

Additional bibliography: Moldenke, Phytologia 7: 381. 1961; Moldenke, Fifth Summ. 1: 148 (1971) and 2: 875. 1971.

CORNUTIA AUSTRALIS var. OCCIDENTALIS Moldenke, Castanea 10: 45. 1945.

Additional bibliography: Moldenke, Phytologia 7: 381. 1961; Moldenke, Fifth Summ. 1: 135 (1971) and 2: 875. 1971.

CORNUTIA COERULEA (Jacq.) Moldenke in Fedde, Repert. Spec. Nov. 40: 189—190. 1936.

Additional & emended synonymy: Cornutia pyramidata Ait., Hort. Kew. 2: 353. 1789 [not C. pyramidata L., 1753, nor León, 1953, nor Spreng., 1825, nor Willd., 1821]. Hostana caerulea Jacq. ex Pers., Sp. Pl. 3: 358—359. 1819.

Additional bibliography: Desf., Tabl. École Bot., ed. 1, 54. 1804; Willd., Enum. Pl. Hort. Berol. 2: 652. 1809; Desf., Tabl. École Bot., ed. 2, 64. 1815; Pers., Sp. Pl. 3: 358—359. 1819; Spreng. in L., Syst. Veg., ed. 16, 1: 39. 1825; Voigt, Hort. Suburb. Calc. 473. 1845; Anon., Biol. Abstr. 48 (14): B.A.S.I.C. B.8. 1967; Hocking, Excerpt. Bot. A.12: 426. 1967; Moldenke, Phytologia 14: 421. 1967; Moldenke, Biol. Abstr. 49: 4199. 1968; Moldenke, Résumé Suppl. 16: 23. 1968; Moldenke, Fifth Summ. 1: 100, 361, & 470 (1971) and 2: 528, 529, 531, & 875. 1971; A. L. Moldenke, Phytologia 23: 319. 1972.

An unidentified editor of "Biological Abstracts" (1967) indexes a paper on Hosta caerulea Tratt. under Verbenaceae even though the abstract itself definitely states that it refers to the "liliaceous" genus Hosta!

Desfontaines (1815) reduces Hosta coerulea Jacq. to the synonymy of Cornutia pyramidata L., while Steudel (1821) does the very opposite: he reduced C. pyramidata L. to the synonymy of C. coerulea. Actually, it is C. pyramidata Ait. which is conspecific with and a synonym of C. coerulea.

CORNUTIA GRANDIFOLIA (Schlecht. & Cham.) Schau. in A.DC., Prodr. 11: 682. 1847.

Additional synonymy: Hosta grandifolia Schlecht. ex Benth., Bot. Voy. Sulphur 154. 1846. Cornutia grandiflora Schau. ex Moldenke, Prelim. Alph. List Invalid Names 23, in syn. 1940; J. F. Morton, 500 Pl. S. Fla. 63. 1974. Cornutia grandifolia (C. & S.) Lehaver ex Fosberg & Klawe in Bowman, Galáp. 188. 1966. Cornutia grandis Moldenke, Fifth Summ. 1: 470, in syn. 1971. Cornutia grandiflora (Schlecht. & Cham.) Schau. ex Moldenke, Phytologia 26: 372, in syn. 1973. Cornutia grandiflora (Sw.) Schaw ex Moldenke, Phytologia 26: 372, in syn. 1973.

Additional bibliography: Metcalfe & Chalk, Anat. Dicot. 1036 & 1037, fig. 248 G. 1950; Fosberg & Klawe in Bowman, Galáp. 188. 1966; Gómez Pompa, Estud. Bot. Misantla 93. 1966; Moldenke, Résumé Suppl. 15: 3, 15, & 20 (1967) and 16: 4 & 20. 1968; Moldenke, Phytologia 14: 420—424 & 426. 1967; Gibson, Fieldiana Bot. 24 (9): 196—198, fig. 37. 1970; Farnsworth, Pharmacog. Titles 6 (9): iii. 1971; Moldenke, Fifth Summ. 1: 69, 79, 81, 83—85, 87, 90, 92, 361, 362, 407, 470, & 471 (1971) and 2: 529—531 & 875—876. 1971; Sáez R. & Nasser C., Revist. Biol. Trop. 18: 137. 1971; Moldenke, Phytologia 21: 102, 387, & 449 (1971) and 23: 415. 1972;

Altschul, Drugs & Foods 245. 1973; Farnsworth, Pharmacog. Titles 6, Cum. Gen. Ind. [35]. 1973; Moldenke, Phytologia 25: 227. 1973; Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 126-129 & 145. 1973; J. F. Morton, 500 Pl. S. Fla. 63. 1974; Molina R., Ceiba 19: 95. 1975.

Additional illustrations: Gibson, Fieldiana Bot. 24 (9): 197, fig. 37. 1970.

Recent collectors describe this plant as a bushy, regular, secondary tree, 3—16.5 m. tall, or a shrub, 2—5 m. tall, the base of the trunk to 45 cm. in diameter, divided near the base into 2 trunks 5—25 cm. in diameter at breast height; bark rugose and cork-like, cream-gray to pale-brown; branches square when young; leaves with a brownish aspect, soft-velvety; petioles tinged violet; flower-buds purple or dark-violet; flowers fragrant, in dense terminal panicles; fruit dark-purple or purple-violet to violet-purple or blackish-blue. A wood sample accompanies Stork 4526.

Collectors have encountered this plant in black sandy soil or the deep sand of acahual in primary vegetation, in forests, high forests, rainforests, cloud forests, and mixed forests, on hillsides and forested rocky hills, on steep heavily wooded slopes with Pinus and Quercus, on north-facing hillslopes, in moist thickets at the edge of forests, in secondary vegetation of high evergreen woods, on lakeshores and in poorly drained soil by lakes, in riparian vegetation and unoccupied clearings, and in areas of half-shade with sun part of each day, at altitudes of 80—2150 meters ("more common at 4000—5000 feet"), flowering from March to November, and fruiting in June and from August to November. Andrew & Alison Moldenke describe it as "a small tree escaped in hedgerows, with magenta fruit". Gómez Pompa reports it growing in association with members of the Lauraceae. In Costa Rica it sometimes grows as a fence tree bordering coffee plantations. A pollen slide has been made from P. H. Allen 1637 by W. H. Lewis and is deposited in the Palynological Laboratory of Washington University and at the Missouri Botanical Garden.

Martínez Calderón refers to the species as "scarce" in Veracruz, Mexico, while Rosas R. describes it as a "regularly abundant tree" there. Yuncker (1940) describes it as a "Small tree about 2.5 meters tall, the branches strongly 4-angled. Leaves densely hairy; flowers violet. In thickets on the foothills." The cultivated plants in Florida, cited below, were raised there from Mexican seed.

Additional vernacular names reported for this plant are "lengua de vaca", "murciélago", and "pavilla".

The corollas are said to have been "blue" on P. H. Allen 1637, Breedlove 14927, Buden 69, Contreras 7807, Cruz C. 238, Dwyer, Durkee, Croat, & Castillon 4571, Molina R. 20562 & 22950, and Tyson, Fosberg, & al. 3973, "light-blue" on Gentle 7968, "purple-blue" on Bunting & Licht 977, "purple" on P. H. Allen 1795, A. Jiménez M. 4007, Martínez-Calderón 1723, Rosas R. 1343, Stork

4526, and Williams, Molina R., & Williams 23440, "dark-purple" on Stork 3009, "lilac" on Beaman 6041 & 6168, "violet" on Contreras 8852 and A. Jiménez M. 3980, "dark-violet" on Stork 4113, "lavender-violet" on Hunter & Allen 537, "blue-violet" on Contreras 4728, and "reddish-violet" on Rodríguez 427.

Gibson (1970) reduces var. purpusi Moldenke and var. quadrangularis Ørst. & Moldenke to synonymy under typical C. grandifolia. Standley (1924) separates C. grandifolia from the Central American and Mexican form of C. pyramidata as follows:

"Corolla minutely glandular-puberulent, the tube 2 mm. thick or less . . . . C. pyramidata

Corolla villosulous, the tube about 3 mm. thick . C. grandifolia"

Material of typical C. grandifolia has been misidentified and distributed in some herbaria as var. intermedia Moldenke, var. quadrangularis Ørst. & Moldenke, and var. normalis (Kuntze) Moldenke [which, in spite of its misleading epithet, is not the typical form of C. grandifolia], C. lilacina Moldenke, and even Aegiphila sp. The Hunter & Allen 537, cited below, was previously cited by me as var. intermedia, but I now feel that it is better regarded as representing the typical form of the species.

On the other hand, the Almeda 321, C. W. Dodge 10723, Jiménez M. 1741, Lent 871, Molina R., Williams, Burger, & Wallenta 17627, Terry & Terry 1379, Ton 2544, Tyson 1266, Tyson & Lazor 5430, Ventura A. 4517, Wedel 2173, and Williams, Molina R., Williams, & Gibson 28871, distributed as typical grandifolia, are actually var. intermedia Moldenke, Correa A. & Stimson 19, Croat 14910, J. A. Duke 5680, Ebinger 485, Jiménez M. 3463, Liesner 847, L. A. M. Riley 120, and Tyson 1274 are var. normalis (Kuntze) Moldenke, Ton 3070 is C. latifolia (H.B.K.) Moldenke, J. D. Dickson 1316 is C. lilacina Moldenke, and Gillis 8464, Pancho 1704, and R. W. Read 1260 are C. lilacina var. velutina Moldenke, and Tyson 2033 is something in the Rubiaceae.

Additional citations: MEXICO: Chiapas: Breedlove 14927 (W—2544608); O. F. Clarke 306 (N, Ws); Ton 2492 (N). Oaxaca: Chavelas P. & Pérez J. 230 (Ip); Liebmann 11306 (Ba). VERACRUZ: Beaman 6041 (Ac), 6168 (Ac); Martínez-Crovetto 1723 [Rec. Inf. D002164] (Mi), 2047 [Rec. Inf. D003945] (Mi); Cruz C. 238 (Ip); Moldenke & Moldenke 2229 (Ac, Z—photo, Z—photo); Rosas R. 1343 (Ac, Mi); Sousa 2748 (W—2634501). GUATEMALA: Alta Verapaz: Contreras 4728 (Au—278579, Ld), 7807 (Au—278864, Ld, W—2558745). El Petén: Contreras 2437 (Au—228044), 8852 (Ld, Ld); C. L. Lundell 16450 (Au—228038); Ortíz 1318 (N). BRITISH HONDURAS: Gentle 7968 (Au—224426, Mi). NICARAGUA: Matagalpa: Bunting & Licht 977 (N, W—2542894); Molina R. 20562 (N), 22950 (N); Williams, Molina R., & Williams 23440 (N). COSTA RICA: Alajuela: A. Jiménez M.

3980 (N), 4007 (N); Stork 4113 [A. F. Smith 13] (N). Cartago: Rodríguez 427 (Tu—132385); Stork 4526 (N); Taylor & Taylor 11465 (N). San José: R. K. Godfrey 67212 (E—1820857); Stork 3009 (N). PANAMA: Coclé: P. H. Allen 1637 (E—1189564), 1795 (E—1189409); Dwyer, Durkee, Croat, & Castillon 4571 (E—1983556); Hunter & Allen 537 (W—1976138); Kirkbride 1073 (E—1982891); Tyson, Fosberg, & al. 3973 (N, W—2730249). CULTIVATED: Florida: Buden 69 (Ws).

CORNUTIA GRANDIFOLIA var. INTERMEDIA Moldenke in Fedde, Repert. Spec. Nov. 40: 167—168. 1936.

Additional bibliography: Moldenke, Phytologia 14: 423. 1967; Moldenke, Résumé Suppl. 15: 3 (1967) and 16: 4. 1968; Gibson, Fieldiana Bot. 24 (9): 196 & 198. 1970; Moldenke, Fifth Summ. 1: 79, 83, 85, 87, 90, & 362 (1971) and 2: 876. 1971; Moldenke, Phytologia 25: 227. 1973; Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 126, 127, & 145. 1973.

Recent collectors describe this plant as a large shrub or tree, 1.5—8 m. tall, the trunk or stems 2.5—15 cm. in diameter at breast height, the leaves villous, the flowers with the scent of lavender (Lavendula), and the fruit blue-purple, lilac, or "flushed lilac". They have encountered it along roadsides, on riverbanks and beaches, in roadside thickets, cloud forests, rainforests, and remnant montane rainforests, along streams and rivers, in secondary forests, in dense partially disturbed forests with Inga, Quercus, and Orchidaceae, and on steep heavily wooded slopes with Taxodium, Erythrina, Piper, and Liquidambar, at altitudes of 16—2165 meters, flowering from December to August, fruiting in February, June, July, and November. The vernacular name, "musciallago" [meaning "bats"], is recorded. Ventura A. refers to it as "very rare" in Veraceuz, Mexico. Jiménez M. found it "en borde de bosque con ramas arqueadas. El par apical de hojitas de cada rama no florecida tiene color púrpurea. Ramas recién cortadas huelen a Lippia dulcis [=Phyla scaberrima (A. L. Juss.) Moldenke]. Usado muy a menudo como poste vivo en cercas" in Alajuela, Costa Rica.

The corollas are said to have been "blue" on Dwyer & Kirkbride 7426 and Terry & Terry 1379,"dark-blue" on Lent 871, "violet" on Almeda 321 and Wedel 2173, "violet-rose" on A. Jiménez M. 1741 & 1742, "lavender" on Lewis, Escobar, Macbryde, Oliver, & Ridgway 2016, Ton 2544, and Tyson & Lazor 5430, "lilac" on Roe, Roe, & Mori 790, and "purple" on Blackwell, Correa A., & Ridgway 2757, Jiménez M. 1635, Lewis, MacBryde, Oliver, & Ridgway 1746, Molina R., Williams, Burger, & Wallenta 17627, and Williams, Molina R., Williams, & Gibson 28871.

Gibson (1970) reduces this taxon to the synonymy of C. pyramidata L., but with this disposition I cannot agree.

Material of C. grandifolia var. intermedia has been misidentified and distributed in some herbaria as typical C. grandifolia

(Schlecht. & Cham.) Schau., C. grandifolia var. normalis (Kuntze) Moldenke, and even "Labiatae". On the other hand, the Hunter & Allen 537, previously cited by me as var. intermedia, is now regarded by me as better placed in typical C. grandifolia.

Additional citations: MEXICO: Chiapas: Ton 2544 (Ws). Veracruz: Ventura A. 4517 (Mi, Tu--186247). GUATEMALA: Sacatepéquez: Roe, Roe, & Mori 790 (Ld). NICARAGUA: Río San Juan: S. B. Robbins 6178 (Ld). COSTA RICA: Alajuela: Almeda 321 (Mi); A. Jiménez M. 1741 (N, W—2566502, Ws, Ws); Molina R., Williams, Burger, & Wallenta 17627 (N); Williams, Molina R., Williams, & Gibson 28871 (W—2537723, Ws). Cartago: Jiménez M. 1635 (N, W—2751898, Ws, Ws); Lent 871 (N, W—2542459). PANAMA: Bocas del Toro: Blackwell, Correa A., & Ridgway 2757 (Ld); Lewis, Escobar, MacBryde, Oliver, & Ridgway 2016 (E—1887600, W—2545847); Wedel 2173 (E—1232421). Canal Zone: Tyson 1266 (E—1812245); Tyson & Lazor 5430 (E—1979896). Coclé: Lewis, MacBryde, Oliver, & Ridgway 1746 (E—1887606, W—2545866). Darién: Terry & Terry 1379 (E—1196288). Panamá: C. W. Dodge 10723 (E—1294411). Veraguas: Dwyer & Kirkbride 7426 (E—1894005, W—2545875).

CORNUTIA GRANDIFOLIA var. NORMALIS (Kuntze) Moldenke in Fedde, Repert. Spec. Nov. 40: 170—171. 1936.

Additional synonymy: Cornutia grandifolia var. normalis Moldenke, Résumé Suppl. 16: 20, in syn. 1968. Cornutia grandis var. normalis Moldenke, Résumé Suppl. 18: 9, in syn. 1969.

Additional bibliography: Moldenke, Phytologia 14: 423--424. 1967; Moldenke, Résumé Suppl. 15: 15 (1967) and 16: 4 & 20. 1968; Moldenke, Fifth Summ. 1: 87, 90, 92, 362, & 470 (1971) and 2: 876. 1971; Altschul, Drugs & Foods 245. 1973; Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 126—129 & 145, fig. 13. 1973.

Illustrations: Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 128, fig. 13. 1973.

Recent collectors describe this plant as a bush or shrub, 2—3.5 m. tall, or a small tree, 4—10 m. tall, fragrant, the stems square, 2.5—15 cm. in diameter at breast height, the foliage fragrant with a minty odor, the flowers also with a minty odor, and the fruit green to purple. They have found it growing at 25 to 1200 meters altitude, flowering from April to October, and fruiting in October. It has been encountered on savannas and wet savannas, along roadsides in savannas, at the edges of forests, on forested riverbanks, in thickets on hillsides, in cutover secondgrowth, pastures, and gallery forests, and along roadsides, often growing in the direct sun. According to Stern and his associates the "crushed leaves have a rank aroma of mint". Altschul (1973) cites Stern & al. 56 and Wedel 2173. The vernacular name, "musciallago" [meaning "bats"], is recorded for this plant.

The corollas are said to have been "lavender" on Dwyer 1073 and on Lewis, MacBryde, Oliver, & Ridgway 1620, "pale-blue" on Woodson, Allen, & Seibert 412, "blue" on P. H. Allen 5034, Croat 14910, Duke 12364 & 12446, Ebinger 485, Jiménez M. 3464, Kuntze 1332, L. A. M. Riley 120, Woodson, Allen, & Seibert 758 & 1737, and Woodson & Schery 1002, "blue-violet" on Liesner 847, and "purple" on Correa A. & Stimson 19, Porter, Crosby, & Baker 5152, and Tyson 1260, 1274, & 1874a.

Material has been misidentified and distributed in some herbaria as typical C. grandifolia (Schlecht. & Cham.) Schau., C. "grandiflora (S. & C.) Schau.", and C. pyramidata L. On the other hand, the P. H. Allen 1637 & 1795, distributed as this variety, are actually typical C. grandifolia (Schlecht. & Cham.) Schau., Blackwell, Correa A., & Ridgway 2757, Dwyer & Kirkbride 7426, Lewis, Escobar, MacBryde, Oliver, & Ridgway 2016, and Lewis, MacBryde, Oliver, & Ridgway 1746 are var. intermedia Moldenke, and Duke 14454 is C. microcalycina var. pulverulenta Moldenke.

Additional citations: COSTA RICA: Puntarenas: Jiménez M. 3464 (N). PANAMA: Canal Zone: Correa A. & Stimson 19 (E--1897432, Mi, N, W--2640353); Croat 14910 (N); Dwyer 1073 (E--1810409, W--2511394); Ebinger 485 (E--1822489); Stern, Chambers, Dwyer, & Ebinger 56 (E--1757557); Tyson 1060 (E--1813010), 1260 (E--1817317), 1274 (E--1812259), 1874a (E--1817313). Chiriquí: Dwyer & Kirkbride 7462 (E--1894007, Oh, W--2545709); Woodson, Allen, & Seibert 412 (E--1170528). Coclé: Woodson, Allen, & Seibert 1737 (E--1170860). Los Santos: Duke 12446 (E--1908629); Lewis, MacBryde, Oliver, & Ridgway 1620 (N). Panamá: Duke 5680 (E--1814165); Porter, Crosby, & Baker 5152 (Ld); Woodson, Allen, & Seibert 758 (E--1170413); Woodson & Schery 1002 (E--1205057). Veraguas: Duke 12364 (E--1908621); Liesner 847 (W--2745304). Province undetermined: L. A. M. Riley 120 (E--1636525).

CORNUTIA GRANDIFOLIA var. PURPUSI Moldenke in Fedde, Repert. Spec. Nov. 40: 169. 1936.

Emended synonymy: Hosta longifolia H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 201. 1817.

Additional & emended bibliography: H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 201 (1817) and ed. quarto, 2: 247. 1818; Barnhart, Bull. Torrey Bot. Club 29: 590. 1902; Moldenke, Phytologia 14: 421, 422, & 424. 1967; Gibson, Fieldiana Bot. 24 (9): 196. 1970; Moldenke, Fifth Summ. 1: 69 & 470 (1971) and 2: 530 & 876. 1971.

It should be noted here that the H.B.K. reference dates given above have been verified by Barnhart (1902).

Gibson (1970) reduces this taxon to the synonymy of typical C. grandifolia (Schlecht. & Cham.) Schau. Material has been misidentified and distributed in some herbaria as Aegiphila sp.

Additional citations: LOCALITY OF COLLECTION UNDETERMINED: Fournier s.n. [acquis en Janvier 1885] (P, P, P, P, P, P); Herb. Mus. Paris s.n. (P).

CORNUTIA GRANDIFOLIA var. QUADRANGULARIS Ørst. & Moldenke ex Moldenke in Fedde, Repert. Spec. Nov. 40: 168. 1936.

Additional synonymy: Cornutia grandifolia var. quadrangularis Moldenke ex Gibson, Fieldiana Bot. 24 (9): 196. 1970.

Additional bibliography: Moldenke, Phytologia 14: 422 & 424. 1967; Gibson, Fieldiana Bot. 24 (9): 196. 1970; Moldenke, Fifth Summ. 1: 87, 470, & 471 (1971) and 2: 876. 1971; Moldenke, Phytologia 32: 237. 1975.

Gibson (1970) reduces this taxon to synonymy under typical C. grandifolia (Schlecht. & Cham.) Schau. The Rodriguez 427, distributed as this variety, actually is typical C. grandifolia and it is possible that the variety should be reduced to form rank.

CORNUTIA GRANDIFOLIA var. STORKII Moldenke in Fedde, Repert. Spec. Nov. 40: 169—170. 1936.

Additional bibliography: Moldenke, Phytologia 14: 424. 1967; Gibson, Fieldiana Bot. 24 (9): 196. 1970; Moldenke, Fifth Summ. 1: 87 (1971) and 2: 876. 1971.

Gibson (1970) reduces this taxon to synonymy under typical C. grandifolia (Schlecht. & Cham.) Schau. and it is, indeed, possible that form rank is all it deserves.

CORNUTIA JAMAICENSIS Moldenke in Fedde, Repert. Spec. Nov. 40: 191—193. 1936.

Additional bibliography: Moldenke, Phytologia 14: 424 & 429. 1967; Moldenke, Fifth Summ. 1: 100 (1971) and 2: 876. 1971.

CORNUTIA LATIFOLIA (H.B.K.) Moldenke in Fedde, Repert. Spec. Nov. 40: 179—181. 1936.

Emended synonymy: Hosta latifolia H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 201. 1817 [not H. latifolia (Miq.) Matsum., 1905]. Cornutia pyramidata Spreng. in L., Syst. Veg., ed. 16, 1: 39. 1825 [not C. pyramidata Ait., 1789, nor L., 1753, nor León, 1953, nor Willd., 1821].

Additional & emended bibliography: H.B.K., Nov. Gen. & Sp. Pl., ed. folio, 2: 201 (1817) and ed. quarto, 2: 248. 1818; Barnhart, Bull. Torrey Bot. Club 29: 590. 1902; Moldenke, Phytologia 14: 424—425 & 428. 1967; Gibson, Fieldiana Bot. 24 (9): 196 & 198. 1970; Moldenke, Fifth Summ. 1: 69, 79, 81, 362, & 470 (1971) and 2: 530 & 876. 1971; Moldenke, Phytologia 32: 237. 1975.

Recent collectors describe this plant as an arborescent shrub, 1—6.5 m. tall, with an unpleasant fetid odor, the trunk 3—12 cm. in diameter at breast height, the stems square, glaucous, the older portions becoming corky, gray, panicles 2.5 x 7 dm., and stamens 2. They have encountered it in low forests, clearings, on slopes with Liquidambar and Erythrina, and in grazed thorn-

scrub forest with Acacia dominant, at an altitude of 1000 meters, flowering in May and from August to October, and fruiting in September. Andrew & Alison Moldenke describe the inflorescences as blue. The corollas are said to have been "blue" on Ortíz 1095, "bluish" on Contreras 6041, "lavender" on Ton 3070, "lavender-blue" on Gilly & Hernandez X. 109, and "light-purple" on Roe, Roe, & Mori 1334, while Sorensen reports the "petals dusty-blue with yellow spot in throat". The vernacular name, "expangage", is recorded for it. Sorenson also reports that "pollination or visitation [is] made by [a] large black butterfly with [a] scarlet jagged band across [the] base of [the] wings".

Gibson (1970) reduces this taxon to the synonymy of her all-inclusive C. pyramidata L. and the two taxa are certainly very closely related. Cytologic studies will have to reveal exactly how close the relationship is. Material has been misidentified and distributed in some herbaria as C. grandifolia (Schlecht. & Cham.) Schau., C. pyramidata L., C. pyramidata var. isthmica Moldenke, C. pyramidata var. "ismithia Moldenke", and even as Labiatae sp. On the other hand, the Gentle 16, Lundell & Lundell 7888, and Matuda 3398, distributed and previously cited by me as C. latifolia, seem actually better placed as C. pyramidata var. isthmica Moldenke.

It should be noted that the revised H.B.K. reference dates given above have been verified by the work of Barnhart (1902).

Additional citations: MEXICO: Chiapas: Ton 3070 (N). Tabasco: Gilly & Hernandez Xolocotzi 109 (Au). Veracruz: Moldenke & Moldenke 2235 (Ac). Yucatán: Enriquez 68 (W--2597486); Roe, Roe, & Mori 1334 (Ld). GUATEMALA: El Petén: Contreras 6041 (Au--278542, W--2558711); Ortíz 1095 (N), 1330 (N). BRITISH HONDURAS: C. L. Lundell 433 (N); Sorensen 7067 (W--2624964).

CORNUTIA LATIFOLIA f. ALBA Moldenke, Phytologia 2: 131. 1948.

Additional bibliography: Moldenke, Phytologia 14: 425. 1967; Gibson, Fieldiana Bot. 24 (9): 196 & 198. 1970; Moldenke, Fifth Summ. 1: 69 (1971) and 2: 876. 1971.

Chavelas and his associates describe this plant as a rare shrub, 2 m. tall, growing in acahuales and pastizales of Panicum maximum, Apeiba tiborbou, Cochlospermum vitifolium, Spondias mombin, Scheelea liebmanni, and Guazuma ulmifolia in deep well-drained soil, flowering in November. They record the vernacular name, "hoha de lara", and distributed their material as typical C. latifolia (H.B.K.) Moldenke.

Additional citations: MEXICO: Veracruz: Chavelas, Esparza, & Aceves ES.2406 (Ip).

CORNUTIA LILACINA Moldenke in Fedde, Repert. Spec. Nov. 40: 181—183. 1936.

Additional bibliography: Moldenke, Phytologia 14: 422 & 425.

1967; Gibson, Fieldiana Bot. 24 (9): 196. 1970; Moldenke, Fifth Summ. 1: 79, 83, 84, & 470 (1971) and 2: 876. 1971; Moldenke, Phytologia 28: 432 (1974), 31: 378 (1975), and 32: 237. 1975.

Recent collectors describe this as a "regular" shrub, 4 m. tall, with purple fruit, and have found it growing in moist and roadside thickets, at 900 m. altitude, flowering in June, and fruiting in September. The corollas are said to have been "violet" in color on Molina R. 83. Gibson (1970) reduces the taxon to synonymy under C. pyramidata L., a West Indian plant.

Material has been misidentified and distributed in some herbaria as C. grandifolia (Schlecht. & Cham.) Schau. On the other hand, the Molina R. 20562 & 22950, distributed as C. lilacina, actually are C. grandifolia, while Molina R. 14377, 14436, 14437, & 22462 are C. lilacina var. velutina Moldenke.

Additional citations: GUATEMALA: Escuintla: Cox 935 [Herb. Cox 981] (Oa). HONDURAS: Cortés: J. D. Dickson 1316 (W--2700696). Morazán: Molina R. 83 (Ba).

CORNUTIA LILACINA var. VELUTINA Moldenke in Fedde, Repert. Spec. Nov. 40: 183. 1936.

Additional bibliography: Moldenke, Phytologia 14: 425--426. 1967; Gibson, Fieldiana Bot. 24 (9): 196. 1970; Moldenke, Fifth Summ. 1: 79, 83, & 84 (1971) and 2: 876. 1971; Moldenke, Phytologia 31: 378 (1975) and 32: 237. 1975.

Recent collectors describe this plant as a small, weak, pubescent tree, 3--5 m. tall, or a large, tall shrub, 2--3 m. tall, with large woolly leaves that are fragrant when bruised, and flowers in terminal panicles, also fragrant when bruised, showy over a long period during the summer. They have encountered it in mixed woods and in open weedy meadows and roadsides, at altitudes of 620--1300 meters, flowering from June to August. Molina R. reports it as "frequent", "common in cutover pine forests", and "common in secondary forests" in Honduras. Pfeifer refers to it on the label of his collection as a "vine to 30 ft.", but surely this must be the result of a secretarial error in transcription!

The corollas are said to have been "blue" on Pfeifer 1460 & 1729, "lilac" on Molina R. 14366, 14436, & 14437, "violet" on Molina R. 22462, Pancho 1604, and R. W. Read 1260, and "lavender-blue" on Gillis 8464.

Read reports that this plant grows well in dry limestone soils. Gibson (1970) reduces it to the synonymy of C. pyramidata L.

Material has been misidentified and distributed in some herbaria as C. grandifolia (Schlecht. & Cham.) Schau., C. lilacina Moldenke, and C. pyramidata L.

Additional citations: HONDURAS: Comayagua: Molina R. 14366 (N). Copán: Molina R. 26232 (N). Distrito Central: Pfeifer 1729 (W). El Paraíso: Pfeifer 1460 (W). Lampira: Molina R. 12981 (N). Morazán: Molina R. 14436 (N), 14437 (W--2567913, W--2568513).

Ocotepeque: Molina R. 22462 (N). Tegucigalpa: Barkley & Boghdan 39400 (Z). CULTIVATED: Florida: Gillis 8464 (Ac, Ba, Ft); Pancho 1604 (Ba); R. W. Read 1260 (Ba--Ft--2196).

CORNUTIA MICROCALYCINA Pavon & Moldenke ex Moldenke in Fedde, Repert. Spec. Nov. 40: 173--175. 1936.

Additional synonymy: Cornutia microcalycina Pav. ex Moldenke apud J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 690. 1960. Cornutia microcalicyna Pav. & Moldenke apud Acosta-Solis, Divis. Fitogeogr. Ecuad. 63, sphalm. 1968. Cornutia microcalycina Moldenke, Fifth Summ. 1: 470, in syn. 1971. Cornutia microcalycina (Pav.) Moldenke, Fifth Summ. 1: 470, in syn. 1971.

Additional bibliography: J. F. Macbr., Field Mus. Publ. Bot. 13 (15): 690. 1960; Fosberg & Klawe in Bowman, Galáp. 188. 1966; Moldenke, Phytologia 14: 426--428. 1967; Moldenke, Résumé Suppl. 15: 20 (1967), 16: 4 (1968), and 17: 8. 1968; Acosta-Solis, Divis. Fitogeogr. Ecuad. 63. 1968; Moldenke, Fifth Summ. 1: 89, 90, 116, 122, 135, 140, 469, & 470 (1971) and 2: 530 & 876. 1971; Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 129--130 & 145. 1973; Lasser, Braun, & Steyerm., Act. Bot. Venez. 9: 36. 1974; Moldenke, Phytologia 28: 435 & 449 (1974) and 32: 240. 1975; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 15: 24. 1975.

Recent collectors describe this plant as a shrub, 4 m. tall, or tree, 6--7 m. tall, the leaves "membranous" or "thick-papery", soft, dull pale-green or medium-green above and paler beneath, lightly tomentose on the venation beneath, the calyx pale-green, and the fruit subglobose-ovoid, pale-green when young, glossy and purple or black when mature. López-Palacios describes it as an "Árbol ca. 6 m. de olor viroso. Hojas de envés tomentoso-velutinoso" and found it to be "Abundante en la zona desde el nivel del mar hasta 1400 m." Others speak of encountering it in open fields and in secondary regrowth at altitudes of 150--580 meters, flowering from May to August, and fruiting from July to September.

The corollas are said to have been "purple" on Breteler 4023 and Curran 160, "blue-purple" on López-Palacios & Bautista 3169, "blue" on Aristeguieta 3255 and López-Palacios 3090, and "purple-lilac" on Stern & al. 471. Stern and his associates speak of it as a "vine on tree", but this is probably an error in observation. A wood sample accompanies Breteler 4023. The vernacular name, "anime de pierra caliente", has been recorded for the plant. Lasser and his associates (1974) speak of it as being cultivated in Venezuela. Acosta-Solis (1968) cites his no. 5211 from Ecuador.

The Castañeda 5565 and Gilmartin 597, distributed as typical C. microcalycina, are actually var. pulverulenta Moldenke.

Additional citations: PANAMA: Darién: Stern, Chambers, Dwyer, & Ebinger 471 (E--1757554). COLOMBIA: Bolívar: Curran 160 (Ws).

VENEZUELA: Barinas: Aristeguieta 3255 (N); Breteler 4023 (N, N, W--2466002, W--2466003), 4605 (W--2582964A); López-Palacios 3090 (Ld). Mérida: López-Palacios & Bautista 3169 (Ld), 3406 (Ld).

CORNUTIA MICROCALYCINA var. ANOMALA Moldenke in Fedde, Repert. Spec. Nov. 40: 176. 1936.

Additional bibliography: Moldenke, Phytologia 14: 426. 1967; Moldenke, Fifth Summ. 1: 89, 90, & 116 (1971) and 2: 876. 1971; Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 130 & 145. 1973.

Emended citations: PANAMA: Darién: Goldman 1896 (W--716154).

CORNUTIA MICROCALYCINA var. PULVERULENTA Moldenke in Fedde, Repert. Spec. Nov. 40: 175--176. 1936.

Additional bibliography: Moldenke, Phytologia 14: 426--428. 1967; Moldenke, Fifth Summ. 1: 90, 116, 135, & 469 (1971) and 2: 876. 1971; Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 130 & 145. 1973; Moldenke, Phytologia 28: 435 (1974) and 32: 240. 1975.

Recent collectors describe this plant as a bush, 3 m. tall, a half-shrub, or a shrub, 2.5--7 m. tall, or even a small tree, 4--9 m. tall, odorous and very medullose, the trunk to 15 cm. in diameter at breast height, the bark gray and with fine fissures, and the fruit blue or purple. They have encountered it on river-banks, in secondary forests, or in very advanced secondary rain-forests, at altitudes of 50--980 meters, flowering in January, February, April, and from July to September, and fruiting in February and from July to September. Játiva & Epling refer to it as "common" and as "common in clearings". Duke reports that it is one of the medicinal plants of the Bayano Cuna Amerinds, while Castañeda says that it is used "para ahuyentar los piojos en nidos de gallinas".

Vernacular names recorded for it are "culapo", "malasap", "nacedero", and "samula". The corollas are said to have been "blue" on Játiva & Epling 2103 & 2149 and López-Palacios 3587, "violet" on Játiva & Epling 470 & 749, "lilac" on Castañeda 5565, and "purple" on Barclay & al. 3159, Lewis & al. 5502, and Little & Dixon 21051.

Material has been misidentified and distributed in some herbaria as C. grandifolia var. normalis (Kuntze) Moldenke, C. microcalycina Pac. & Moldenke, and C. odorata var. colombiana Moldenke.

Additional citations: PANAMA: Coclé: Lewis, Porter, Duke, & Baker 5502 (Z). Darién: J. A. Duke 14454 (E--1908443). COLOMBIA: Antioquia: López-Palacios 3587 (Ld) Meta: Barclay, Juajibioy, & Gama 3159 (W--2702290). Nariño: Castañeda 5565 (N). ECUADOR: Esmeraldas: Játiva & Epling 470 (N), 749 (N, N, W--2707200), 2103 (N, S, W--2600856), 2149 (E--2165237, N, S, W--2600843); A. J. Gilmartin 597 (N); Little & Dixon 21051 (N, W--2644741).

[to be continued]

STUDIES IN THE EUPATORIEAE (ASTERACEAE). CXLVIII.

A NEW SPECIES OF LOMATOZOMA.

R. M. King and H. Robinson
Department of Botany
Smithsonian Institution, Washington, D.C. 20560

The genus Lomatozoma was described by Baker in Martius Flora Brasiliensis in 1876 and has been regarded as monotypic since that time. The genus has been recognized most readily by a rather superficial character of the type species, the bipinnately dissected leaves. A second species of the genus described here, has leaves only shallowly lobed but agrees in all basic characters of the genus, the prismatic achenes, the scarcely differentiated carpopodia, and the very short setae of the pappus. The new species differs from the type species of the genus by the shallowly lobed leaves, the blunt phyllaries that lack glands on the outer surface and the achenes that have setae on the upper parts of the ribs. The carpopodium of the new species differs in minute details, being narrower with a few more sclerotized cells and being borne immediately below the setiferous part of the achene. In L. artemisiifolia Baker the carpopodium is separated from the setiferous area by a very short glabrous zone.

Lomatozoma andersonii R.M.King & H.Robinson, sp. nov. Plantae erectae frutescentes usque ad 4 dm altae multo ramosae. Caules teretes vix striati. Caules folia et pedicelli glandulis stipitatis minutis dense obsiti. Folia opposita distincte petiolata, petiolis 4-11 mm longis; laminae plerumque 1.5-2.8 cm longae 1.4-2.5 cm latae utrinque vadose 3-6 late lobatae base truncatae apice obtusae. Inflorescentae laxe cymosae, ramis ultimis ca. 1 cm longis. Capitula ca. 7 mm alta 3 mm lata; flores ca. 25; squamae involucri ca. 25 imbricatae ca. 4-seriatae 1-5 mm longae oblongae trinervatae apice obtusae extus glabrae margine anguste scariosae et minute glanduliferae. Corollae ca. 3.5 mm longae anguste infundibulares, tubis ca. 0.5 mm longis, lobis ca. 0.5 mm longis extus pauce setiferis et stipitate glanduliferis; filamenta in parte superiore ca. 300µ longa; appendices antherarum ovato-oblongae ca. 300µ longae et 175µ latae. Achaenia ca. 1.8 mm longa in costis breviter setifera; carpopodia minuta sessilia, cellulis 1-2-seriatis; setae pappi

ca. 20 plerumque 0.4-0.8 mm longae dense scabridae. Grana pollinis ca. 20μ diam.

TYPE: BRAZIL: Goias: Serra dos Pirineus. ca. 15 km N of Corumba de Goias; elevation 1250-1300 meters, 14 May 1973. William R. Anderson 10258 (Holotype US).

Acknowledgement

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Lomatozoma andersonii R.M.King & H.Robinson, Holotype, United States National Herbarium. Photos by Victor E. Krantz, Staff Photographer, National Museum of Natural History.

Lomatozoma andersonii R.M.King & H.Robinson, Enlargement of heads.

STUDIES IN THE EUPATORIEAE (ASTERACEAE). CXLIX. A NEW GENUS, OSMIOPSIS.

R. M. King and H. Robinson
Department of Botany
Smithsonian Institution, Washington, D.C. 20560

The distribution of various characteristics among the West Indian Eupatorieae indicates hybridization has occured between two genera that would not otherwise seem closely related, Koanophyllon and Chromolaena. The results are apparently widespread in dilution of characters among some species of both genera. In a species from Haiti, the recombination of characters is such that they cannot be tolerated within either parent genus. This species is the basis for the new genus, Osmiopsis described here. The plants have the habit and involucre of Chromolaena and the species has previously been placed in Chromolaena by the authors (King & Robinson, 1970). However, the flowers have broad glanduliferous corolla lobes, short anther appendages and enlarged tips on the style branches that are like Koanophyllon and unlike Chromolaena.

The hybrid origin of Osmiopsis and some other West Indian intermediates is based on circumstantial evidence of character distribution. Evidence would indicate further that such hybrids were totally viable and capable of further evolution, but that the hybridizations all apparently date from some earlier period and are not continuing at this time.

Osmiopsis R.M.King & H.Robinson, genus novum Asteracearum.

Plantae frutescentes vel scandentes mediocriter ramosae. Caules teretes vel parum angulosi. Folia opposita petiolata, laminis lanceolatis vel lobatis laevibus base trinervatis supra sparse glanduliferis et minute puberulis subtus saepe dense glandulo-punctatis non pubescentibus. Inflorescentiae thrysiformes, ramis oppositis erecto-patentibus corymbosis; squamae involucri imbricatae 4-5-seriatae omnino deciduae; receptacula plana vel leniter convexa glabra; flores 18-26; corollae infundibulares extus et intus laeves extus glanduliferae, cellulis elongatis, parietibus sinuosis, lobis aequaliter-aliter triangularibus vel latioribus extus dense glanduliferis; filamenta in parte superiore brevia, cellulis plerumque quadratis, parietibus leniter noduliferis; cellulae exotheciales subquadratae, appendicibus antherarum breviter oblongis latioribus quam longioribus; styli inferne glabri non nodulosi, appendicibus stylorum anguste

linearibus breviter papillosis apice vix vel distincte clavatis sublaevibus. Achenia prismatica 5-costata sparse glandulifera vel minute spiculifera; carpopodia breviter cylindrica, cellulis superficialibus distinctis subquadratis minutis ca. 9-seriatis, parietibus subincrassatis; setae pappi 25-30 uniseriatae scabridae superne sensim leniter vel distincte incrassatae, cellulis apicalibus acutis. Grana pollinis 20-22μ diam. minute spinulosa.

Species typica *Eupatorium plumerii* Urban & Ekman

The genus is monotypic.

Osmiopsis plumerii(Urban & Ekman) R.M.King & H. Robinson, comb. nov. *Eupatorium plumerii* Urban & Ekman, Arkiv. Bot. 23A(11): 52. 1931. Haiti.

Osmiopsis plumerii is similar in aspect to two Haitian species of *Koanophyllon* and they are sometimes confused in herbaria. The *Koanophyllon* species, *K. selleana* (Urban) K. & R. and *K. phanioides* (Urban & Ekman) K. & R. differ by having 8-12 flowers per head and involucres with some spreading persistant bracts at the base.

Reference

King, R. M. & H. Robinson 1970. Studies in the Eupatorieae (Compositae). XXIX. The genus, *Chromolaena*. Phytologia 20:196-209.

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STUDIES IN THE EUPATORIEAE (ASTERACEAE). CL. LIMITS OF THE GENUS *KOANOPHYLLON*.

R. M. King and H. Robinson
Department of Botany
Smithsonian Institution, Washington, D.C. 20560

An initial attempt to delimit the genus *Koanophyllon* (King & Robinson, 1971) used a rather narrow concept for the genus while acknowledging numerous related species in the West Indies. Various additions to the genus (K. & R., 1972, 1974a, 1974b) have all continued to be within the narrow interpretation. A final analysis of the related groups has indicated that a broader concept of *Koanophyllon* is preferable. The new complete list of species is included here with indications of some of the closely related genera.

In the broadened concept of *Koanophyllon* certain characters are given less importance. The inflorescence of the typical element was pyramidally paniculate but in the majority of added species they are corymbose. The anther appendage was usually short and with a median groove but in the broader concept the appendage is often short but most often not grooved. Still, numerous characters remain which help to distinguish the genus. Species of *Koanophyllon* have comparatively short-petiolate leaves except for *K. consanguineum* of Brazil. The character is particularly notable in comparisons with many members of the *Hebeclinium* relationship. The leaves of *Koanophyllon* are glandular punctate as are the corollas and involucres. Only in *K. prinoides* have no glands been seen on the leaves under the binocular microscope. The character of glands on leaves and corollas is particularly notable in comparisons with the genus *Critonia*. The leaves are almost always opposite with subopposite and ternate leaves found only *K. myrtilloides*. The receptacle of *Koanophyllon* is bare without either paleae or hairs. The base of the corolla is broadly tubular and scarcely distinct from the limb. The nectary is usually quite large exdending upward partly into the broad tubular corolla base. The corolla lobes are relatively broad and often broader than long with numerous glands clustered on the outer surface. The corolla lobes have no hairs or only a few short hairs. The anther collars have the walls of the cells unornamented or weakly ornamented. The strongest annular ornamentation is in *K. albicaule*. The style base is slender and

smooth and the style tips are often but not always knobbed. The carpopodium has small cells with slightly thickened walls and the pappus when present is persistent with often incrassate setae.

As presently recognized the genus contains a number of unique species and species groups. In the typical element in Central America are K. standleyi having no pappus and K. ravenii having a very short pappus, in Brazil is K. baccharifolium having more strongly hastate bases on the anthers, in Bolivia is K. jugipaniculatum with its unusually large pinnately veined leaves, in Brazil is K. thysanolepis with its large coarse heads and partially dentate phyllaries and also in Brazil is K. myrtilloides with its unique phyllotaxy.

Of particular concern in the genus are the variations in the involucre. Most species have eximbricate phyllaries and some are as marked in this character as any Gyptoid genera. The species with subimbricate rounded phyllaries seem to be scattered through the genus. In the typical element the progression from eximbricate species to the strongly subimbricate condition in K. pittieri is so gradual that taxonomic subdivision above the species level is impossible. The Colombian K. mesoreopolum may be related to this series. Completely different relationship is evident in the scandent K. tetrantherum of Jamaica with its very diffuse panicle and four flowers per head. Two species in Haiti, K. selleanum and K. phanioides, differ from the genus Osmopsis only in one significant technical feature, the persistent outermost bracts of the involucre. The last two species seem to be part of the taxonomically difficult group in the West Indies derived from hybridization between Chromolaena and Koanophyllon. In all the species of Koanophyllon with subimbricate involucres the phyllaries are relatively broad and blunt. The more acute forms of Grisebachianthus and the more elongate involucres of Lorentzianthus and Fleischmanniopsis seem to represent yet more separately derived but related types.

Some of the genera related to Koanophyllon have been mentioned in previous papers of this series. Sphaereupatorium of South America and Mexianthus and Neohintonia of Central America are all notable for the spherical form of the inflorescences and the latter two have only one flower in each individual head. Eupatoriastrum of Central America is distinct by the heads with ca. 300 flowers and prominent paleae. In the West Indies Grisebachianthus can be distinguished from Koanophyllon by the tomentose leaves and stems combined with the imbricated acute-tipped phyllaries.

Osmopsis is technically Praxeloid by its totally deciduous involucre. Related South American genera include Ophryosporus of the classical genera, the more recently described Badilloa and Vittetia, and the genera Chacoa, Lorentzianthus and Idiothamnus described in accompanying papers. Ophryosporus differs from Koanophyllon by the anther appendage almost totally vestigial, the phyllaries few and totally eximbricate, and the corolla base narrower. Badilloa has broader strap-shaped style branches and mostly larger pollen. Vittetia was originally thought of as Gyptoid because of its extremely papillose style branch. The genus is further distinguished from Koanophyllon by the very narrow base of the corolla. Idiothamnus is distinct by the paleaceous receptacle and has a rather distinctive habit with large pinnately veined ascending leaves. Chacoa differs from Koanophyllon by narrow based corollas and one of the species has distinctly alternate leaves. The monotypic Lorentzianthus has strongly subimbricate elongate involucres and has long-petiolate leaves similar to members of the Hebeclinium relationship.

There are some species of Stomatanthes that have corollas resembling Koanophyllon and confusion might result if style bases are not observed carefully.

Our expanded concept of the genus indicates that it contains the following 109 species. Th species preceeded by an asterisk (*) have not previously been placed in the genus.

* Koanophyllon adamantium (Gardn.) R.M.King & H.Robinson, comb. nov. Eupatorium adamantium Gardn. in Lond. J. Bot. 5:477. 1846. Brazil.

Koanophyllon albicaule (Schultz-Bip. ex Klatt) K. & R., Phytologia 22(3):149. 1971. Eupatorium albicaule Schultz-Bip. ex Klatt, Leopoldina 20:89. 1884. Mexico.

* Koanophyllon atroglandulosum (Alain) R.M.King & H. Robinson, comb. nov. Eupatorium atroglandulosum Alain, Contr. Ocas. Mus. Hist. Nat. Col. 'de la Salle' Habana 18:3. 1960. Cuba. Included here on basis of description; see Alain 1960.

* Koanophyllon ayapanoides (Griseb.) R.M.King & H.Robinson, comb. nov. Eupatorium ayapanoides Griseb., Cat. Pl. Cub. 146. 1866. Cuba.

* Koanophyllon baccharifolium (Gardn.) R.M.King & H. Robinson, comb. nov. Eupatorium baccharifolium Gardn., Lond. J. Bot. 4:116. 1845. Brazil.

* Koanophyllon barahonense (Urb.) R.M.King & H.Robinson, comb. nov. Eupatorium barahonense Urb., Fedde Repert. 17:10. 1921. Hispaniola.

* Koanophyllon breviflorum (Alain) R.M.King & H.Robinson, comb. nov. Eupatorium breviflorum Alain, Contr. Ocas. Mus. Hist. Col. 'de la Salle' Habana. Included only on basis of description; see Alain 1960. Cuba.

* Koanophyllon bullescens (B.L.Robinson) R.M.King & H. Robinson, comb. nov. Eupatorium bullescens B.L. Robinson, Contr. Gray Herb. n.s. 51:533. 1916. Cuba.

* Koanophyllon cabaionum (Urb. & Ekm.) R.M.King & H. Robinson, comb. nov. Eupatorium cabaionum Urb. & Ekm., Arkiv. Bot. (Stockh.) 23A (11):65. 1931. Haiti.

* Koanophyllon calcicola (Urb.) R.M.King & H.Robinson, comb. nov. Eupatorium calcicola Urb. Symb. Ant. 5:524. 1908. Hispaniola.

Koanophyllon celtidifolium (Lam.) K. & R. Phytologia 22(3):149. 1971. Eupatorium celtidifolium Lam., Encyc. 2:406. 1788. Syn. Eupatorium plicata Urban, Symb. Antill 5:523. 1906. Colombia, Ecuador, Guatemala?, Jamaica, Lesser Antilles, Peru, Venez.

* Koanophyllon chabrense (Urban & Ekman) R.M.King & H. Robinson, comb. nov. Eupatorium chabrense Urban & Ekman, Arkiv. Bot. (Stockh.) 23A(11):58. 1931. Haiti.

* Koanophyllon chalceorithales (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium chalceorithales B.L.Robinson, Contr. Gray Herb. n.s. 77:10. 1926. Cuba.

* Koanophyllon clementis (Alain) R.M.King & H.Robinson, comb. nov. Eupatorium clementis Alain, Contr. Ocas. Mus. Hist. Col. 'de la Salle' Habana 18:4. 1960. Cuba.

* Koanophyllon consanguineum (A.P.Decandolle) R.M.King & H.Robinson, comb. nov. Eupatorium consanguineum A. P. Decandolle, Prodr. 5:166. 1836. Brazil.

Koanophyllon coulteri (B.L.Robinson) K. & R., Phytologia 22(3):149. 1971. Eupatorium coulteri B.L.Robinson, Proc. Amer. Acad. 36:477. 1901. Guatemala.

* Koanophyllon cubense (A.P.Decandolle) R.M.King & H. Robinson, comb. nov. Eupatorium cubense A.P. Decandolle, Prodr. 5:172. 1836. Cuba.

* Koanophyllon cynanchifolium (A.P.Decandolle) R.M.King & H.Robinson, comb. nov. Eupatorium cynanchifolium A.P.Decandolle, Prodr. 5:172. 1836. Cuba.

* Koanophyllon delpechianum (Urban & Ekman) R.M.King & H.Robinson, comb. nov. Eupatorium delpechianum Urban & Ekman, Arkiv Bot. (Stockh.) 23A (11):60. 1931. Haiti.

* Koanophyllon dolicholepis (Urban) R.M.King & H.Robinson, comb. nov. Eupatorium villosum var. dolicholepis Urban, Fedde Repert. 17:52. 1921. Puerto Rico.

* Koanophyllon dolphinii (Urban) R.M.King & H.Robinson, comb. nov. Eupatorium dolphinii Urban, Symb. Ant. 5:522. 1908. Jamaica.

* Koanophyllon droserolepis (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium droserolepis B.L.Robinson, Proc. Amer. Acad. 54:243. 1918. Puerto Rico.

Koanophyllon dukei K. & R. Phytologia 28(1):68. 1974. Panama.

Koanophyllon eitenii R.M.King & H.Robinson, sp. nov.

Plantae frutescentes erectae usque ad 1.5 m altae mediocriter ramosae. Caules teretes striati fulvi dense hispiduli. Folia opposita breviter petiolata, petiolis 2-3 mm longis; laminae late ovatae 1.5-2.5 mm longae 1.2-2.0 mm latae base cordatae trinervatae vel quinquenervatae margine serrulatae apice acutae vel minute acuminatae supra glabrae lucidae subtus glandulo-punctatae in nervis et nervulis minute puberulae. Inflorescentiae corymboso-paniculatae, ramis ultimis 1-6 mm longis minute puberulis et glanduliferis. Capitula 6-7 mm alta; squamae involucri ca. 20 eximbricatae

lanceolatae plerumque 4-5 mm longae extus minute puberulae vel subglabrae bicostatae apice anguste acutae vel acuminatae margine non scariosae; receptacula plana glabra. Flores ca. 17 in capitulo; corollae ca. 3.5 mm longae plerumque tubulosae extus plerumque glabrae, lobis ca. 0.4 mm longis aequilateraliter triangularibus extus dense glanduliferis; filamenta in parte superiore brevia 0.1 mm longa; thecae ca. 1.1 mm longae; appendices antherarum oblongo-ovatae ca. 0.2 mm longae; appendices stylorum filiformes leniter mamillosae apice vix clavatae. Achaenia 1.5-1.8 mm longa sparse glandulifera; carpopodia brevia lata, cellulis ca. 8-seriatus subquadratis 10-16μ diam, parietibus incrassatis; setae pappi ca. 30 ca. 3.0-3.5 mm longae inferne remote scabridae apice leniter incrassatae, cellulis apicalibus subacutis vel obtusis. Grana pollinis 20-22μ diam.

TYPE: BRAZIL: Goias: Municipio de Caldas Novas: at headwaters of the creek, Rio Quente, at the hotel, "Pousada do Rio Quente", 13 km WSW of city of CALDAS NOVAS. 17^0 48'S. 48^0 45'W. 21 Dec 1974. Heringer & Eiten 14155 (Holotype US).

The new species is of a habit similar to many West Indian members of the genus but the only species with similar appearance in Brazil is *K. myrtilloides*. The latter species happens to differ rather strikingly by its phyllotaxy which is unique in the genus. In *K. eitenii* the leaves are opposite but in *K. myrtilloides* the leaves of the main stems are ternate while those of the branches become subopposite or alternate.

* **Koanophyllon ekmanii** (B.L.Robinson) R.M.King & H.Robinson, comb. nov. *Eupatorium ekmanii* B.L.Robinson, Contr. Gray Herb. n.s. 77:15. 1926. Cuba.

* **Koanophyllon flavidulum** (Urb. & Ekm.) R.M.King & H. Robinson, comb. nov. *Eupatorium flavidulum* Urb. & Ekm., Arkiv. Bot. (Stockh.) 23A (11):61. 1931. Haiti.

Koanophyllon flexile (B.L.Robinson) K. & R. Phytologia 22(3):150. 1971. *Eupatorium flexile* B.L.Robinson, Proc. Amer. Acad. 55:14. 1919. Peru.

* **Koanophyllon fuscum** (N.E.Brown) R.M.King & H.Robinson, **comb. nov.** *Eupatorium fuscum* N.E.Brown, Trans. Lin. Soc. ser.2 6:39. 1901. Venezeula.

* Koanophyllon gabbii (Urb.) R.M.King & H.Robinson, comb. nov. Eupatorium gabbii Urb., Fedde Repert. 17:50. 1921. Hispaniola.

* Koanophyllon gibbosum (Urb.) R.M.King & H.Robinson, comb. nov. Eupatorium gibbosum Urb., Fedde Repert. 17:49. 1921. Hispaniola.

* Koanophyllon gracilicaule (Sch.-Bip. ex B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium gracilicaule Sch.-Bip. ex B.L.Robinson, Proc. Amer. Acad. 42:39. 1906. Mexico.

* Koanophyllon gracilipes (Urb.) R.M.King & H.Robinson, comb. nov. Eupatorium gracilipes Urb., Symb. Antill. 5:522. 1908. Jamaica.

* Koanophyllon gundlachii (Urb.) R.M.King & H.Robinson, comb. nov. Eupatorium gundlachii Urb., Symb. Antill. 3:399. 1903. Cuba.

* Koanophyllon hammatocladum (B.L.Robinson & N.L.Britton) R.M.King & H.Robinson, comb. nov. Eupatorium hammatocladum B.L.Robinson & N.L.Britton, Proc. Amer. Acad. 54:246. 1918. Jamaica.

* Koanophyllon hardwarense (G.R.Proctor & C.D.Adams) R. M.King & H.Robinson, comb. nov. Eupatorium hardwarense G.R.Proctor & C.D.Adams, Phytologia 21: 409. 1971. Jamaica.

* Koanophyllon helianthemoides (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium helianthemoides B.L.Robinson, Contr. Gray Herb. n.s. 77:17. 1926. Cuba.

* Koanophyllon heptaneurum (Urb.) R.M.King & H.Robinson, comb. nov. Eupatorium heptaneurum Urb., Symb. Antill. 7:554. 1913. Dominican Republic.

* Koanophyllon hidrodes (B.L.Robinson) R.M.King & H. Robinson, comb. nov. Eupatorium hidrodes B.L.Robinson, Contr. Gray Herb. n.s. 73:12. 1924. Cuba.

Koanophyllon hondurense (B.L.Robinson in Standley) K. & R., Phytologia 22(3):150. 1971. Eupatorium hondurense B.L.Robinson in Standley, J. Arnold Arb. 11:44. 1930. Honduras.

* Koanophyllon hotteanum (Urb. & Ekm.) R.M.King & H. Robinson, comb. nov. Eupatorium hotteanum Urb. & Ekm., Arkiv. Bot. (Stockh.) 23A(11):63. 1931. Haiti.

Koanophyllon huantae (B.L.Robinson) K. & R., Phytologia 22(3):150. 1971. Eupatorium huantae B.L.Robinson, Contr. Gray Herb. n.s. 104:16. 1934. Peru.

Koanophyllon hylonomum (B.L.Robinson) K. & R., Phytologia 22(3):150. 1971. Eupatorium hylonomum B.L. Robinson, Proc. Bost. Soc. Nat. Hist. 31:250. 1904. Costa Rica.

Koanophyllon hypomalacum (B.L.Robinson ex J.D. Smith) K. & R., Phytologia 22(3):150. 1971. Eupatorium hypomalacum B.L.Robinson ex J.D.Smith, Bot. Gaz. 35:4. 1903. Guatemala.

* Koanophyllon incisum nom. nov. R.M.King & H.Robinson, Eupatorium incisum Griseb., Cat. Pl. Cub. 146. 1866. not Eupatorium incisum L.C.M.Rich. 1792. Dominican Republic.

* Koanophyllon isillumense (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium isillumense B.L. Robinson, Proc. Amer. Acad. 55:20. 1919. Peru.

* Koanophyllon iteophyllum (Urb. & Ekm.) R.M.King & H. Robinson, comb. nov. Eupatorium iteophyllum Urb. & Ekm., Arkiv. Bot. (Stockh.)23A(11):57. 1931. Haiti.

* Koanophyllon jaegerianum (Urb.) R.M.King & H.Robinson, comb. nov. Eupatorium jaegerianum Urb., Symb. Antill. 3:394. 1903. Haiti.

* Koanophyllon jensenii (Urb.) R.M.King & H.Robinson, comb. nov. Eupatorium jensenii Urb., Arkiv. Bot. (Stockh.) 17(7):64. 1921. Haiti.

* Koanophyllon jugipaniculatum (Rusby) R.M.King & H. Robinson, comb. nov. Eupatorium jugipaniculatum Rusby, Bull. New York Bot. Gard. 4:379. 1907. Bolivia.

* Koanophyllon juninense (B.L.Robinson) R.M.King & H. Robinson, comb. nov. Eupatorium juninense B.L.Robinson, Contr. Gray Herb. n.s. 77:20. 1926. Peru.

* Koanophyllon kavanayense (Badillo) R.M.King & H.Robinson, comb. nov. Eupatorium kavanayense Badillo, Bol. Soc. Venez. Cienc. Nat. 10:293. 1946. Venezuela,

* Koanophyllon lindenianum (A.Rich.) R.M.King & H.Robinson, comb. nov. Eupatorium lindenianum A.Rich. in Sagra, Fl. Cub. Fanerog. 3:42. 1853. Cuba.

* Koanophyllon littorale R.M.King & H.Robinson, nom. nov. Eupatorium littorale Alain, Contr. Ocas. Mus. Hist. Nat. Col. 'de la Salle' Habana 18:4. 1960. not Eupatorium littorale Cabrera, 1959. Cuba.

Koanophyllon lobatifolium (Cabrera) K. & R., Phytologia 29(2):123. 1974. Eupatorium lobatifolium Cabrera, in Cabrera & Vittet, Sellowiana 15:192. 1963. Brazil.

Koanophyllon longifolium (B.L.Robinson) K. & R., Phytologia 22(3):150. 1971. Eupatorium longifolium B.L.Robinson, Proc. Amer. Acad. 36:480. 1901. Mexico.

* Koanophyllon maestrense (Urb.) R.M.King & H.Robinson, comb. nov. Eupatorium maestrense Urb., Symb. Ant. 3:397. 1903. Cuba.

* Koanophyllon mesoreopolum (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium mesoreopolum B.L.Robinson, Contr. Gray Herb. n.s. 73:15. 1924 Colombia.

* Koanophyllon microchaetum (Urb. & Ekm.) R.M.King & H.Robinson, comb. nov. Eupatorium microchaetum Urb. & Ekm., Arkiv. Bot. (Stockh.) 23A(11):62. 1931. Hispaniola.

Koanophyllon mimicum (Standl. & Steyerm.) K. & R., Phytologia 22(3):150. 1971. Eupatorium mimicum Standl. & Steyerm., Publ. Field Mus. Nat. Hist. Chicago, Bot. Ser. 23:186. 1944. Guatemala.

* Koanophyllon minutifolium (Alain) R.M.King & H.Robinson, comb. nov. Eupatorium minutifolium Alain, Contr. Ocas. Mus. Hist. Nat. Col. 'de la Salle' Habana 18:5. 1960. Cuba.

* Koanophyllon miragoanae (Urb.) R.M.King & H.Robinson, comb. nov. Eupatorium miragoanae Urb. Fedde Rep. 17:11. 1921. Haiti.

* Koanophyllon montanum (Sw.) R.M.King & H.Robinson, comb. nov. Eupatorium montanum Swartz, Nov. Gen. & Sp. Pl. Prodr. 111: 1788. Jamaica.

* Koanophyllon mornicola (Urb. & Ekm.) R.M.King & H. Robinson, comb. nov. Eupatorium mornicola um Urb. & Ekm. Arkiv. Bot. (Stockh.) 23A(11):65. 1931. Haiti.

* Koanophyllon muricatum (Alain) R.M.King & H.Robinson, comb. nov. Eupatorium muricatum Alain, Contr. Ocas. Mus. Hist. Nat. Col. 'de la Salle', Habana 18:8. 1960. Cuba.

* Koanophyllon myrtilloides (A.P.Decandolle) R.M.King & H.Robinson, comb. nov. Eupatorium myrtilloides A.P.Decandolle, Prodr. 5:165. 1836. Brazil.

* Koanophyllon nervosum (Swartz) R.M.King & H.Robinson, comb. nov. Eupatorium nervosum Swartz, Nov. Gen. & Sp. Pl. Prodr. 111. 1788. Hispaniola.

* Koanophyllon nudiflorum (A.Rich.) R.M.King & H.Robinson, comb. nov. Eupatorium nudiflorum A.Rich. in Sagra Fl. Cub. Fanerog. 3:41. 1853. Cuba.

* Koanophyllon obtusissimum (A.P.Decandolle) R.M.King & H.Robinson, comb. nov. Eupatorium obtusissimum A.P.Decandolle, Prodr. 5:173. 1836. Dominican Republic.

* Koanophyllon oligadenium (Alain) R.M.King & H.Robinson, comb. nov. Eupatorium oligadenium Alain, Contr. Ocas. Mus. Hist. Nat. Col. 'de la Salle', Habana. 18:7. 1960. Included only on basis of description, see Alain (1960). Cuba.

* Koanophyllon pachyneurum (Urb.) R.M.King & H.Robinson, comb. nov. Eupatorium pachyneurum Urb., Fedde Repert. 17:10. 1921. Hispaniola.

Koanophyllon palmeri (Gray) K. & R. Phytologia 22(3): 150. 1971. Eupatorium palmeri Gray, Proc. Amer. Acad. 21:383. 1886. Mexico.

Koanophyllon panamense K. & R., Phytologia 28(1):67. 1974. Panama.

* Koanophyllon paucicrenatum (Urb. & Ekm.) R.M.King & H.Robinson, comb. nov. Eupatorium paucicrenatum

Urb. & Ekm., Arkiv. Bot. (Stockh.) 23A(11):59. 1931. Hispaniola.

* Koanophyllon phanioides (Urb. & Ekm.) R.M.King & H. Robinson, comb. nov. Eupatorium phanioides Urb. & Ekm., Arkiv. Bot. (Stockh.) 23A(11:54. 1931. Haiti.

* Koanophyllon picardae (Urb.) R.M.King & H.Robinson, comb. nov. Eupatorium picardae Urb., Fedde Repert. 17:51. 1921. Haiti.

* Koanophyllon pitonianum (Urb. & Ekm.) R.M.King & H. Robinson, comb. nov. Eupatorium pitonianum Urb. & Ekm., Arkiv. Bot. (Stockh.) 23A(11):64. 1931. Haiti.

Koanophyllon pittieri (Klatt) K. & R. Phytologia 22(3): 150. 1971. Eupatorium pittieri Klatt, Bull. Soc. Bot. Belg. 31:192. 1892 (1893). Costa Rica, Mexico.

* Koanophyllon polyodon(Urb.) R.M.King & H.Robinson, comb. nov. Eupatorium polyodon Urb. Symb. Antill. 1:462. 1900. Puerto Rico.

* Koanophyllon polystictum (Urb.) R.M.King & H.Robinson, comb. nov. Eupatorium polystictum Urb., Symb. Antill. 3:400. 1903. Cuba.

* Koanophyllon porphyrocladum (Urb. & Ekm.) R.M.King & H.Robinson, comb. nov. Eupatorium porphyrocladum Urb. & Ekm., Arkiv. Bot. (Stockh.) 23A(11): 56. 1931. Haiti.

* Koanophyllon prinodes (B.L.Robinson) R.M.King & H. Robinson, comb. nov. Eupatorium prinodes B.L.Robinson, Contr. Gray Herb. n.s. 77:30. 1926. Cuba.

Koanophyllon pseudoperfoliatum (Schultz-Bip. ex Klatt) K. & R., Phytologia 22(3):150. 1971. Eupatorium pseudoperfoliatum Schultz-Bip. ex Klatt, Leopoldina 20:75. 1885. Mexico.

* Koanophyllon puberulum (A.P.Decandolle) R.M.King & H.Robinson, comb. nov. Eupatorium puberulum A.P.Decandolle, Prodr. 5:172. 1836. Hispaniola.

Koanophyllon ravenii K. & R., Phytologia 22(3):150. 1971. Mexico.

* Koanophyllon reversum (Urb.) R.M.King & H.Robinson, comb. nov. Eupatorium reversum Urb., Arkiv. Bot. (Stockh.) 7(7):64. 1922. Haiti.

* Koanophyllon rhexioides (B.L.Robinson) R.M.King & H. Robinson, comb. nov. Eupatorium rhexioides B.L. Robinson, Proc. Amer. Acad. 51:535. 1916. Syn. E. cristalense Urb. Cuba.

* Koanophyllon rubroviolaceum (Urb. & Ekm.) R.M.King & H.Robinson, comb. nov. Eupatorium rubroviolaceum Urb. & Ekm., Arkiv. Bot. (Stockh.) 23A(11):62. 1931. Haiti.

* Koanophyllon scabriusculum (Urb. & Ekm.) R.M.King & H.Robinson, comb. nov. Eupatorium scabriusculum Urb. & Ekm., Arkiv. Bot. (Stockh.) 23A(11):59. 1931. Haiti.

* Koanophyllon sciatraphes (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium sciatraphes B.L.Robinson, Proc. Amer. Acad. 54:257. 1918. Hispaniola, Venezeula.

* Koanophyllon selleanum (Urb.) R.M.King & H.Robinson, comb. nov. Eupatorium selleanum Urb., Fedde Repert. 17:9. 1921. Haiti.

* Koanophyllon semicrenatum (Urb.) R.M.King & H.Robinson, comb. nov. Eupatorium semicrenatum Urb., Symb. Antill. 3:398. 1903. Hispaniola.

* Koanophyllon silvaticum (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium silvaticum B.L. Robinson, Contr. Gray Herb. n.s. 77:37. 1926. Cuba.

* Koanophyllon simile (Proctor) R.M.King & H.Robinson, comb. nov. Eupatorium simile Proctor, Bull. Inst. Jam. Sci. Ser., no. 16:71. 1967. Jamaica.

Koanophyllon simillimum (B.L.R.) K. & R., Phytologia 22(3):151. 1971. Eupatorium simillimum B.L.R., Contr. Gray Herb. n.s. 77:38. 1926. Argentina, Paraguay.

Koanophyllon solidaginifolium (Gray) K. & R., Phytologia 22(3):151. 1971. Eupatorium solidaginifolium Gray, Smiths. Contr. Knowl. 3(5):87. 1852. Ariz., N. Mex., Tex., Northern Mexico.

Koanophyllon solidaginoides (H.B.K) K. & R., Phytologia 22(3):151. 1971. Eupatorium solidaginoides H.B.K., Nov. Gen. et Sp. 4:126. 1818. Ed. Folio. Braz., Colo., Costa Rica, Ecuad., Honduras, Mex., Panama, Peru, El Salvador, Venez.

Koanophyllon sorensenii K. & R., Phytologia 23(4):395. 1972. British Honduras.

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Koanophyllon stipuliferum (Rusby) K. & R., Phytologia 22(3):151. 1971. Eupatorium stipuliferum Rusby, Mem. Torrey Bot. Club. 4:210. 1895. Argentina, Bolivia.

* Koanophyllon subpurpureum (Urb. & Ekm.)R.M.King & H. Robinson, comb. nov. Eupatorium subpurpureum Urb. & Ekm., Arkiv. Bot. (Stockh.)23A(11):66. 1931. Dominican Republic.

* Koanophyllon tapeinanthum (Urb.) R.M.King & H.Robinson, comb. nov. Eupatorium tapeinanthum Urb., Fedde Repert. 17:51. 1921. Haiti.

* Koanophyllon tatei (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium tatei B.L.Robinson, Bull. Torrey Bot. Club 58:484. 1931. Venezeula.

* Koanophyllon tetranthum (Griseb.) R.M.King & H.Robinson, comb. nov. Eupatorium tetranthum Griseb., Fl. Brit. W. Ind. 360. 1861. Jamaica.

* Koanophyllon thysanolepis (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium thysanolepis B.L.Robinson, Contr. Gray Herb. n.s. 75:13. 1925. In many herbaria as E. hebecladium DC. Some were corrected by B. L. Robinson. The type of the latter species has been seen and seems to be Barrosoa candolleana (Hook. & Arn.) K. & R. Brazil.

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* Koanophyllon tricephalotes (Schultz-Bip. ex Baker) R.M.King & H.Robinson, comb. nov. Eupatorium tricephalotes Schultz-Bip. ex Baker, in Mart., Fl. Bras. 6(2):322. 1876. Brazil.

* Koanophyllon triradiatum (Urb.) R.M.King & H.Robinson, comb. nov. Eupatorium triradiatum Urb., Symb. Antill. 3:396. 1903. Haiti.

* Koanophyllon villosum (Swartz) R.M.King & H.Robinson, comb. nov. Eupatorium villosum Swartz, Nov. Gen. & Sp. Pl. Prodr. 111. 1788. syn. Eupatorium poeppigii Spreng.? S. Florida, Greater Antillarum.

Koanophyllon wetmorei (B.L.R.) K. & R., Phytologia 28(1):67. 1974. Eupatorium hypomalacum var. wetmorei B.L.Robinson, Contr. Gray Herb. n.s. 104: 17. 1934. Panama.

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______ & ______ 1972. Studies in the Eupatorieae (Asteraceae). LXXII. Notes on the genus, Koanophyllon. Phytologia 23(4):395-396.

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Acknowledgement

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Koanophyllon eitenii R.M.King & H.Robinson, Holotype, United States National Herbarium. Photos by Victor E. Krantz, Staff Photographer, National Museum of Natural History.

Koanophyllon eitenii R.M.King & H.Robinson,
Enlargement of heads.

STUDIES IN THE EUPATORIEAE (ASTERACEAE). CLI.

A NEW GENUS, GRISEBACHIANTHUS.

R. M. King and H. Robinson
Department of Botany
Smithsonian Institution, Washington, D.C. 20560

Eight species of eastern Cuba form a distinct endemic element recognized here as a new genus Grisebachianthus. The genus has the general habit and floral characters of the related Koanophyllon but seems uniquely specialized in the tomentose stems and leaf undersurfaces and in the strongly subimbricate phyllaries. The phyllaries are particularly notable in being more like some Vernonieae than like any of the related Critonioid forms. It is the phyllaries that most clearly distinguish the genus from all members of Koanophyllon including some having similar habits and some few having different types of subimbricate involucres. The genus can also be distinguished from most of Koanophyllon by the corolla lobes being narrower than long.

Grisebachianthus R.M.King & H.Robinson, genus novum Asteracearum (Eupatorieae). Plantae frutescentes pauce ramosae. Caules teretes minute striati. Caules et folia subtus dense tomentosa vel villosa. Folia opposita plerumque breviter petiolata; lamina ovatis vel deltoideis supra subglabra vel sparse pilifera utrinque glandulo-punctata base saepe trinervata. Inflorescentiae corymboso-paniculatae, ramis inferioribus oppositis saepe recte patentibus. Capitula in glomerulis irregularibus congesta; squamae involucri subimbricatae 4-5-seriatae partim deciduae tomentosae vel villosae et glanduliferae; receptacula plana et glabra; flores 12-60; corollae infundibulares extus et intus laeves, cellulis elongatis, parietibus sinuosis, lobis longioribus quam latioribus extus glanduliferis; filamenta in parte superiore distincta,cellulis inferioribus subquadratis, parietibus leniter ornatis; cellulae exothecialibus subquadratae, appendicibus antherarum ovatis vel brevioribus; styli inferne glabri non nodulosi, appendicibus stylorum anguste linearibus breviter papillosis apice clavatis sublaevibus. Achaenia prismatica 5-costata superne sparse setifera et glandulifera; carpopodia breviter cylindrica, cellulis superficialibus distinctis subquadratis minutis ca. 8-10 seriatis, parietibus subincrassatis; setae

pappi 20-30 uniseriatae vel subbiseriatae scabridae superne leniter incrassatae, cellulis apicalibus subacutis. Grana pollinis 18-20μ diam. minute spinulosa.

Species typica: Eupatorium plucheoides Griseb.

The species of Grisebachianthus may be determined with the following key.

1. Leaves with petioles 5-10 mm long -- G. carsticola

1. Leaves subsessile, petioles usually less than 5 mm long ------------------------------------ 2

2. Heads with 30-60 flowers -------------------- 3

2. Heads with 10-27 flowers--------------------- 5

3. Anther appendage about half as long as wide, often strongly bilobed; leaves mostly pinnately veined G. libanotica

3. Anther appendage about as long as wide, scarcely bilobed; leaves usually prominently trinerved from near base ----------------------------- 4

4. Stems and undersurfaces of leaves brownish tomentose; leaf undersurface not closely reticulated; heads with 36-60 flowers G. plucheoides

4. Stems and undersurfaces of leaves whitish tomentose; leaf undersurface with prominent close reticulations; heads with 30-40 flowers G. hypoleucus

5. Leaves with short tomentum below; heads with 10-12 flowers ------------------------ G. nipensis

5. Leaves densely tomentose below; heads with 12-27 flowers ------------------------------------ 6

6. Stems and undersurfaces of leaves brownish tome tomentose; leaves broadly ovate to ovate-elliptical; phyllaries mostly obtuse G. lanatanifolius

6. Stems and undersurfaces of leaves whitish or grayish tomentose; leaves ovate to oblong-ovate; phyllaries often acute ------------ 7

7. Leaves rough on upper surface ------- G. mayarensis

7. Leaves shiny on upper surface ---- G. holquinensis

Our studies of the genus indicate that it contains the following eight species.

Grisebachianthus carsticola (Borhidi & Muniz) R.M.King & H.Robinson, comb. nov. Eupatorium carsticola Borhidi & Muniz, Acta Bot. Acad. Sci. Hungar. 18: 45. 1973.

Grisebachianthus holquinensis (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium holquinense B.L.Robinson, Contr. Gray Herb. n. s. 77:18. 1926. Much of the material in herbaria under the name E. hypoleucum belongs here. Syn? Eupatorium heterophyllum A. Rich. non Eupatorium heterophyllum D.C.

Grisebachianthus hypoleucus (Griseb.) R.M.King & H.Robinson, comb. nov. Eupatorium hypoleucum Griseb., Mem. Amer. Acad. n.s. 8:512. 1863.

Grisebachianthus lantanifolius (Griseb.) R.M.King & H. Robinson, comb. nov. Eupatorium lantanifolium Griseb. Mem. Amer. Acad. n.s. 8:511. 1863.

Grisebachianthus libanotica (Sch.-Bip.) R.M.King & H. Robinson, comb. nov. Eupatorium libanoticum Sch.-Bip., Journ. Bot. 1:234. 1863. syn. Eupatorium reticulatum A. Rich. non E. reticulatum Desv.

Grisebachianthus mayarensis (Alain) R.M.King & H.Robinson, comb. nov. Eupatorium mayarense Alain, Contr. Ocas. Mus. Hist. Nat. Col. 'de la Salle' Habana 18:5. 1960.

Grisebachianthus nipensis (B.L.Robinson) R.M.King & H. Robinson, comb. nov. Eupatorium nipense B.L.Robinson, Contr. Gray Herb. n.s. 77:25. 1926.

Grisebachianthus plucheoides (Griseb.) R.M.King & H. Robinson, comb.nov. Eupatorium plucheoides Griseb., Mem. Amer. Acad. n.s. 8:511. 1863.

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STUDIES IN THE EUPATORIEAE (ASTERACEAE). CLII.

A NEW GENUS, IMERIA.

R. M. King and H. Robinson
Department of Botany
Smithsonian Institution, Washington, D.C. 20560

The tribe Eupatorieae is not particularly well represented in the Guayana Highlands Region of northern South America. Some widely distributed forms such as *Chromolaena* are known and there is an endemic genus, *Guayania*, having five species mostly from the Venezeulan state of Bolivar. An additional distinctive species occurs farther south in the southernmost part of Venezeula on the mountain now known as Neblina.

The plant originally described as *Eupatorium memorabile* is unlike other members of the tribe but similar to many other plants of the tepuis in the rigidly branched habit and coriaceous leaves. The hairs of the stems and leaves have prominent enlarged bases, the crowded somewhat persistent bases forming a papillose cover on the young stems. The involucres are similar in aspect to *Chromolaena* but the outer bracts tend to persist indefinitely with the fleshy bases rotting rather than dehiscing. The species has a particularly prominent hirsute receptacle. The prominent callus on the outer surface of the corolla lobes is another feature suggesting relation to *Chromolaena*. A rather unique feature of the species seems to be the cellular structure of the achene walls where the cell walls are thickened without trace of the punctations seen in most members of the tribe. The species is treated here as a distinct genus showing a combination of *Chromolaena* and Critonioid characters. The coarse habit is entirely distinctive and the hirsute receptacle provides distinction from more closely related forms.

In naming the genus *Imeria* we have chosen to honor the original name given to Neblina by Spruce. The name Imeri has been used by some for the mountains to the south of Neblina-Imeri but there can be no doubt as to which mountain Spruce originally applied the name.

Imeria R.M.King & H.Robinson, genus novum Asteracearum (Eupatorieae). Plantae erectae frutescentes grossae mediocriter ramosae. Caules teretes hirsuti glabrescentes, basibus pilorum multicellularibus distincte incrassatis aliquantum persistentibus. Folia opposita breviter distincte petiolata; laminae ovatae vel

ellipticae coriaceae margine integrae apice breviter acutae supra grosse pilosae et glanduliferae subtus sparse pilosae et dense glanduliferae, nervis pinnatis. Inflorescentiae corymbosae; capitula in ramis congesta sessilia. Involucri squamae imbricatae 4-5-seriatae valde inaequales exteriores subpersistentes interiores deciduae; receptacula dense setifera. Flores ca. 10 in capitulo; corollae anguste infundibulares glabrae, lobis angustis intus laevibus extus superne valde mamillosis et scleroidis; filamenta in parte superiore subincrassata, cellulis oblongis annulate ornatis; cellulae exotheciales subquadratae; appendices antherarum oblongo-ovatae longiores quam latiores; styli inferni glabri non nodulosi; appendices stylorum lineares leniter mamillosae; achaenia prismatica inferne non angustiora, costis plerumque 7-9, parietibus cellularum incrassatis non punctatis; carpopodia breviter cylindrica, cellulis subquadratis 5-6-seriatis, parietibus valde incrassatis; pappus setiformis 1-2-seriatus persistens, setis ca. 50 remote scabridis apice subclavatis, cellulis apicalibus subacutis vel obtusis. Grana pollinis ca. 27-30μ diam.

Species typica: Eupatorium memorabile Maguire & Wurdack

The genus is monotypic.

Imeria memorabilis (Maguire & Wurdack) R.M.King & H. Robinson, comb. nov. Eupatorium memorabile Maguire & Wurdack, Mem. N. Y. Bot. Gard. 9(3):366. 1957. Venezeula.

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STUDIES IN THE EUPATORIEAE (ASTERACEAE). CLIII. A NEW GENUS, LORENTZIANTHUS.

R. M. King and H. Robinson
Department of Botany
Smithsonian Institution, Washington, D.C. 20560

The Eupatorieae of the Koanophyllon relationship are most numerous in the Central American and West Indian region but also show some diversity in the southeastern parts of South America. In the area of southern Brazil, Bolivia and Northern Argentina there occur a few species of Koanophyllon, the single species of Sphaereupatorium and Vittetia and two species of Chacoa. A single species of the eastern edge of the Andes in Argentina and adjacent Bolivia represents another member of this relationship recognized here as the genus Lorentzianthus. The new genus differs from all the associated relatives by the prominent stramineus multiseriate phyllaries in a strongly subimbricate involucre and by the easily deciduous setae of the pappus. Only some more tropical members of Koanophyllon of this relationship have subimbricate phyllaries in 3 or rarely 4 series; and most related genera have notably stout pappus setae that spread at maturity. The usually pyramidal inflorescence of Lorentzianthus also presents a rather unique appearance.

The single species recognized in the genus has an essentially continuous range from Santa Cruz in Bolivia southward through Jujuy, Salta, and Tucuman to Cordoba in Argentina but the plants have not previously been recognized as identical. The Bolivian material which sometimes has narrower more nearly entire leaves has been recognized under the name Eupatorium santacruzense Hieron. Two unvalidated names, Eupatorium nemorense Schultz-Bip. and Eupatorium erythrolepis Schultz-Bip., have also entered the literature on the basis of Bolivian material of the species.

Lorentzianthus R.M.King & H.Robinson, genus novum Asteracearum (Eupatorieae). Plantae erectae frutescentes usque ad 3-4 m altae mediocriter ramosae. Caules teretes vel obscure sexangulares dense puberuli. Folia opposita distincte anguste petiolata; laminae ovatae trinervatae subtus glandulopunctatae nervulis distinctis dense reticulatis. Inflorescentiae pyramidaliter corymboso-paniculatae, pedicellis tenuibus; squamae

involucri subimbricatae ca. 5-seriatae valde inaequilongae ovatae vel oblongo-lineares stramineae glabrae 2-4-costae apice rotundatae margine late scariosae; receptacula parum convexa epaleacea glabra. Flores ca. 10-12 in capitulo; corollae anguste infundibulares extus plerumque in lobis glanduliferae, tubis mediocriter angustioribus, lobis late triangularibus laevibus; filamenta antherarum in parte superiore non praesertim elongata, cellulis inferne subquadratis; parietibus vix ornatis; appendices antherarum ovato-oblongae longiores quam latiores; styli inferne glabri non nodulosi, appendices stylorum lineares sublaeves apice vix latiores; achaenia 5-costata plerumque superne et in costis setifera; carpopodia minuta brevia; cellulis minutis subquadratis 2-3-seriatis; pappus setiformis uniseriatis facile deciduus tenuis scabridus apice non incrassatus, cellulis apicalibus argute acutis. Grana pollinis ca. 20-22μ diam.

Species typica: Eupatorium viscidum Hook. & Arn.

The genus contains the following single species.

Lorentzianthus viscidus (Hook. & Arn.) R.M.King & H. Robinson, comb. nov. Eupatorium viscidum Hook. & Arn. in Hook. Comp. Bot. Mag. 241. 1835.

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STUDIES IN THE EUPATORIEAE (ASTERACEAE). CLIV.

A NEW GENUS, CHACOA.

R. M. King and H. Robinson
Department of Botany
Smithsonian Institution, Washington, D.C. 20560

Among the southernmost members of the Koanophyllon relationship are two species of the Chaco region of Paraguay and Argentina here recognized as a new genus, Chacoa. The two species differ from each other in a number of details but both have a markedly eximbricate involucre and a narrow basal tube on the corolla. The latter character is of particular significance in view of the characteristically broad tubes on the corollas of Koanophyllon. The long-petiolate leaves are also unusual in the Koanophyllon complex, being notable in K. consanquinea and in Lorentzianthus viscidus, both in the area of Bolivia and southern Brazil southward. Chacoa seems to represent one of the extreme developments of the Koanophyllon complex at the southern end of its range.

The narrow corolla tube is found in one other Brazilian member of the Koanophyllon complex, Vittetia. The latter genus is most distinct in the strongly papillose style branch and for that reason was at the time of description placed near Gyptis. Vittetia differs further from Chacoa by the essentially sessile leaves, the slightly subimbricate involucre and the rose colored corollas. Vittetia seems more closely related to other elements of the genus Koanophyllon than to Chacoa.

Chacoa R.M.King & H.Robinson, genus novum Asteracearum (Eupatorieae). Plantae frutescentes erectae mediocriter ramosae. Caules teretes vel obscure sexangulares puberuli vel hispiduli. Folia opposita vel alternata distincte anguste petiolata; laminae ovatae vel deltoideae base trinervatae supra et subtus glandulopunctatae. Inflorescentiae cymosae vel subcymosae, pedicellis brevibus vel longioribus; squamae involucri eximbricatae ca. 2-seriatae subaequilongae lanceolatae vel lineares herbaceae vix scariosae; receptacula parum convexa glabra epaleacea. Flores ca. 20-45 in capitulo; corollae albae infundibulares extus plerumque in lobis glanduliferae vel minute spiculiferae, tubis angustis vel perangustis, lobis triangularibus vel late triangularibus laevibus; filamenta antherarum in parte

superiore non praesertim elongata, cellulis inferne subquadratis, parietibus vix ornatis; appendices antherarum ovato-oblongae longiores quam latiores; styli inferne glabri non nodulosi, appendices stylorum lineares sublaeves apice parum latiores; achaenia 5-costata glandulifera vel setifera; carpopodia minute breviter cylindrica, cellulis minutis subquadratis 6-8-seriatis; pappus setiformis uniseriatis persistentis, setis scabridis apice non vel vix incrassatis, cellulis apicalibus argute acutis. Grana pollinis ca. 22μ diam.

Species typica: Eupatorium pseudoprasifolium Hassl.

The two species of Chacoa show numerous differences of which the following are most notable.

1. Leaves alternate; heads with 30-45 flowers; achenes minutely glanduliferous . . . . C. mikaniifolia

1. Leaves opposite; heads with ca. 20 flowers, achenes setiferous. . . . . C. pseudoprasiifolia

Chacoa mikaniifolia (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium mikaniifolium B.L.Robinson, Contr. Gray Herb. n.s. 104:22. 1934.

Chacoa pseudoprasiifolia (Hassl.) R.M.King & H.Robinson,comb. nov., Eupatorium pseudoprasiifolium Hassl., Fedde Repert. 15: 25. 1919.

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STUDIES IN THE EUPATORIEAE (ASTERACEAE). CLV.

A NEW GENUS, IDIOTHAMNUS.

R. M. King and H. Robinson
Department of Botany
Smithsonian Institution, Washington, D.C. 20560

In the efforts to reach a final resolution of the tribe Eupatorieae the value of the new approach is shown again in a group of four species related to Koanophyllon. Also, the remarkable insight of B.L.Robinson is shown regarding three of the species which he noted as similar in spite of their totally different geography. The fourth species of the genus from Venezeula was originally described as Eupatoriastrum clavisetum by Badillo on the basis of the paleaceous receptacles. The paleaceous condition proves to be characteristic of all four species and they are segregated here as a new genus, Idiothamnus.

The genus is in the Critonioid relationship close to Koanophyllon and Eupatoriastrum and has the paleae as in the latter. Eupatoriastrum differs, however, by the 200-300 flowered heads, the short anther appendages and the hollow stems. It is likely that Idiothamnus and Eupatoriastrum are more closely related to Koanophyllon than to each other and they have apparently developed paleaceous receptacles separately.

Paleae are present on the receptacles of all four species of Idiothamnus but these are least prominent in I.lilloi. The genus can be recognized also by the characteristically elliptical pinnately veined leaves with acuminate bases and tips. The predominently ascending position of the leaves in dried specimens also lends to the distinctive appearance.

Idiothamnus R.M.King & H.Robinson, genus novum Asteracearum (Eupatorieae). Plantae frutescentes. Caules teretes minute puberuli. Folia opposita breviter petiolata; lamina elliptica base cuneata apice acuminata subtus glandulo-punctata nervis secondariis pinnatis. Inflorecentiae corymbosae, ramis patentibus vel erecto-patentibus. Involucri squamae 2-3-seriatae subinaequales; receptacula paleacea. Flores 10-20 in capitulo; corollae anguste infundibulares epilosae, lobis longe triangularibus laevibus extus glanduliferis; filamenta in parte superiore brevia, cellulis inferioribus quadratis, parietibus non vel pauce ornatis;

appendices antherarum ovatae longiores quam latiores; styli inferne glabri non nodulosi, appendices stylorum filiformes sublaeves apice vix clavatae laeves; achaenia 5-costata sparse setifera inferne angustiora; carpopodia parva brevia cylindrica vel obturaculiformia, cellulis minutis subquadratis 6-7-seriatis; pappus setiformis uniseriatis persistens patentescens, setis interdum subincrassatis 20-30 apice plerumque clavatis, cellulis apicalibus acutis. Grana pollinis ca. 18-22μ diam.

Species typica: Eupatoriastrum clavisetum Badillo

The geography of the new genus is perplexing with its wide dispersion of localized species. Idiothamnus pseudorgyalis occurs in the ranges near Rio de Janeiro; I. orgyalioides is known only from near Tarapoto in Peru; I. lilloi is known only from the eastern slopes of the Argentine Andes from Salta and Tucuman; and I. clavisetus has been found only in the Costal Range of north-central Venezeula. This suggests either a distribution mechanism superior to that of most Eupatorieae or it is the remnants of a much wider distribution in the past. The habit of the plants suggests more of a woodland habitat than in most members of the tribe. Such an ecological difference could help explain the distribution.

The four species can be distinguished as follows:

1. Leaves serrate; heads with ca. 12 flowers. . . . 2

1. Leaves entire; heads with 18-20 flowers; phyllaries with 2-4 ribs 3

2. Branches puberulous; phyllaries ovate to oblong with 6-8 ribs, tips usually not reflexed; pappus with ca. 30 setae . . . . . . I. pseudorgyalis

2. Branches tomentellous; phyllaries mostly lanceolate with 2-4 ribs, with reflexed tips; pappus with ca. 20 setae . . . . I. lilloi

3. Branches of inflorescence usually spreading at right angles; phyllaries sharply pointed with tips often dentate; with the outer surface nearly glabrous . . . . I. orgyaloides

3. Branches of inflorescence ascending; phyllaries with short-pointed mostly entire tips, with outer surface puberulous . . . . I. clavisetus

The genus contains the following four species.

Idiothamnus clavisetus (Badillo) R.M.King & H.Robinson, comb. nov. Eupatoriastrum clavisetum Badillo, Bol. Soc. Venez. Cien. Nat. 8:238. 1943.

Idiothamnus lilloi (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium lilloi B.L.Robinson, Contr. Gray Herb. n.s. 90:27. 1930.

Idiothamnus orgyaloides (B.L.Robinson) R.M.King & H. Robinson, comb. nov. Eupatorium orgyaloides B.L. Robinson, Proc. Amer. Acad. 55:24. 1919.

Idiothamnus pseudorgyalis R.M.King & H.Robinson, sp. nov.
Plantae frutescentes erectae pauce ramosae. 1-2 m altae? Petiolae 1.0-1.5 cm longae; laminae 12-20 cm longae 4-9 cm latae base sensim anguste cuneatae margine serrulatae apice anguste acuminatae supra sparse pilosae subtus pilosae et glandulo-punctatae. Inflorescentiae late corymbosae usque ad 7 cm altae et 11 cm latae, ramis ultimis plerumque 1-2 mm longis. Capitula ca. 6 mm alta; flores ca. 12 in capitulo; squamae involucri ca. 15 inaequales 2-5 mm longae 2-3 seriatae ovatae vel lanceolatae apice acutae vel subacutae margine parce vel non scariosae extus 6-8 striatae exteriores minute puberulae; paleae lineari-lanceolatae ca. 5 mm longae. Corollae 3.5 mm longae, lobis ca. 0.5 mm longae et 0.4 mm latae; filamenta in parte superiore ca. 175μ longa; thecae ca. 1 mm longae, appendicibus ca. 175μ longis et 150μ latis. Achaenia ca. 2 mm; cellulae carpopodiorum 10-12μ diam; setae pappi ca. 30 ca. 3 mm longae.

TYPE: BRAZIL: Brasilia. Riedel sn. (Holotype GH)

Photographs of Eupatorium orgyale from the DeCandolle herbarium show a plant resembling Austroeupatorium inulaefolium (H.B.K.) K. & R. and there is a name E. duodecimiflorum Sch.-Bip. nom. nud. published by Baker (1876) in the synonmy of E. orgyale. On this topic B. L. Robinson (1930) says," The sheet in the Prodromus Herbarium representing DeCandolle's E. orgyale bears unfortunately mixed material. The specimens to which is attached the label of Blanchets no. 1923, mentioned in the original diagnosis, is wholly at variance with DeCandolle's description for it has deltoid-ovate 3-nerved leaves rounded or subcordate at base instead of the ovate-lanceolate pinnately nerved leaves cuneate at base called for by the diagnosis. On the same sheet is a very poor specimen from Rio de

Janeiro presumably collected by Lund. This seems to have furnished most of the characters set down by DeCandolle and may be regarded as the type. DeCandolle seems to have been in error in stating that the heads were sessile and 6-flowered. At all events, in authentic material of _E. duodecimiflorum_ Sch.-Bip., which appears to represent the Lund element in _E. orgyale_ and to correspond with the essentials of its original diagnosis, the heads are about 12-flowered and are shortly, but clearly pedicellate."

The view of B. L. Robinson is not accepted here as further reading of the diagnosis and study of the microfiche of the DeCandolle herbarium provide too much evidence to the contrary. The two specimens in the DeCandolle herbarium labelled as Lund and Blanchet both have the abruptly narrowed bases of the _Austroeupatorium_ type.

The misshapen fragment apparently cited by B. L. Robinson is mounted slightly apart from either of the plants cited by DeCandolle and there is no indication of origin. What can be seen indicates that this is also not the species generally known as _E. orgyale_ but the important consideration is that it was not cited by the original author and should not be selected as the type.

It is further noteworthy that DeCandolle probably did intend his description to apply to the _Austroeupatorium_ like plants. He said the leaves were "late ovato-lanceolatis" and the term ovate was not used elsewhere in the Eupatorieae unless the leaf were more abruptly narrowed below. DeCandolle in "basi cuneatis" was probably referring to the cuneately winged petiole, and the trinervate condition of the leaf is not clear since all secondaries are equally ascending. A final consideration would be DeCandolle's reference to "invol. squamis 2-ser. oblongis obtusis" and "Invol. albida", appropriate characters for _Austroeupatorium_ but not acceptable for the Brazilian species of _Idiothamnus_.

DeCandolle probably was incorrect in his statement about 6-flowered heads as both Baker and B. L. Robinson commented.

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Robinson, B. L. 1930. Records preliminary to a general treatment of the Eupatorieae, VIII. Contr. Gray Herb. n.s. 90:3-36.

Idiothamnus pseudorgyalis R.M.King & H.Robinson, Holotype, Gray Herbarium. Photos by Victor E. Krantz, Staff Photographer, National Museum of Natural History.

Idiothamnus pseudorgyalis R.M.King & H.Robinson, Enlargement of heads.

STUDIES IN THE EUPATORIEAE (ASTERACEAE). CLVI.

VARIOUS NEW COMBINATIONS.

R. M. King and H. Robinson
Smithsonian Institution, Washington, D.C. 20560.

The continuing studies in the Eupatorieae have shown the need for the following new combinations in various genera.

Chromolaena heterosquamea (Urb. & Ekm.) R.M.King & H.Robinson, comb. nov. *Eupatorium heterosquameum* Urban & Ekman, Arkiv. Bot. (Stockh.). 23A (11): 54. 1931. Dominican Republic.

Chromolaena mendezii (DC.) R.M.King & H.Robinson, comb. nov. *Eupatorium mendezii* DC., Prodr. 5: 160. 1836. Mexico.

Chromolaena sinuata (Lam.) R.M.King & H.Robinson, comb. nov. *Eupatorium sinuatum* Lam., Encyc. 2: 407. 1788. West Indies.

Chromolaena stillingiaefolia (DC.) R.M.King & H.Robinson, comb. nov. *Eupatorium stillingiaefolium* DC., Prodr. 5: 160. 1836. Mexico.

Four species are added to *Chromolaena*, 2 from Mexico and 2 from the West Indies. The four species belong technically in the subgenus *Osmiella* which lacks papillae on the inner surface of the corolla lobes. The species have imbricate or totally deciduous phyllaries, have linear non-clavate style branches, and elongate anther appendages. The 2 species from the West Indies have variation in persistance of the phyllaries and have a habit similar to some of the *Koanophyllon* species in the area. Some intergeneric hybridization seems to be involved between *Chromolaena* and *Koanophyllon* throughout the range of the subgenus *Osmiella* and one Haitian species originally placed in the subgenus is such a mixture of the generic characters that it has since been treated as a monotypic genus, *Osmiopsis* K.& R. The removal of *Osmiopsis plumeri* from *Chromolaena* leaves the two additions in this paper as the only members of *Chromolaena* subgenus Osmiella in the West Indies, and these from a distinctive element probably worthy of a separate subgenus.

Ayapana stenolepis (Steetz) R.M.King & H.Robinson, comb. nov. Eupatorium stenolepis Steetz in Seemann, Bot. Voy. Herald 148. 1854. Bolivia, Panama.

The combination is necessary for this name that takes priority over Ayapana pyramidalis (Klatt) K.& R. The older name is based on a panamanian type while the Klatt name was based on bolivian material.

Ageratina oaxacana (Klatt) R.M.King & H.Robinson, comb. nov. Eupatorium oaxacanum Klatt, Abh. Naturf. Ges. Halle 15: 324. 1882. Mexico.

A duplicate of the type has been seen in material obtained on loan through the kindness of the Museum National d'Histoire Naturelle in Paris. A second immature specimen anotated by B.L.Robinson "Trapiche de la Concepcion de Comaltepec, Salle-Mexico" (BM) has also been seen.

Disynaphia praeficta (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium praefictum B.L.Robinson, Contr. Gray Herb. n.s. 68: 30. 1923. Brazil.

The species has the 5-flowered heads and the crowded spirally inserted leaves that are typical of the genus. The achene is unusually densely setiferous.

Cronquistianthus callacatensis (Hieron.) R.M.King & H.Robinson, comb. nov. Eupatorium callacatense Hieron., Engl. Bot. Jahrb. 36: 468. 1905. Peru.

The species seems more herbaceous than others presently known in the genus.

Critoniella leucolithogena (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium leucolithogenum B.L.Robinson, Contr. Gray Herb. n.s. 80: 25. 1928. Colombia.

Hebeclinium killipii (B.L.Robinson) R.M.King & H.Robinson, comb. nov. Eupatorium killipii B.L.Robinson, Contr. Gray Herb. n.s. 77: 21. 1926. Colombia.

The species of *Critoniella* was recently transferred into *Hebeclinium* even though the lack of convexity of the receptacle was noted (King & Robinson, 1975). The distinctive species has been reexamined and proves to be a *Critoniella* though the style branch is thicker than in other members of the genus. Examination of another Colombian species shows that it should be added to the genus *Hebeclinium*.

Reference

King, R. M. and Robinson, H. 1975. Studies in the Eupatorieae (Asteraceae). CXLVII. Additions to the genera *Amboroa*, *Ayapanopsis*, and *Hebeclinium* in South America. Phytologia 31: 311-316.

Acknowledgement

This study was supported in part by the National Science Foundation Grant BMS 70-00537 to the senior author.

A NEW COSTA RICAN CLIDEMIA

Louis O. Williams

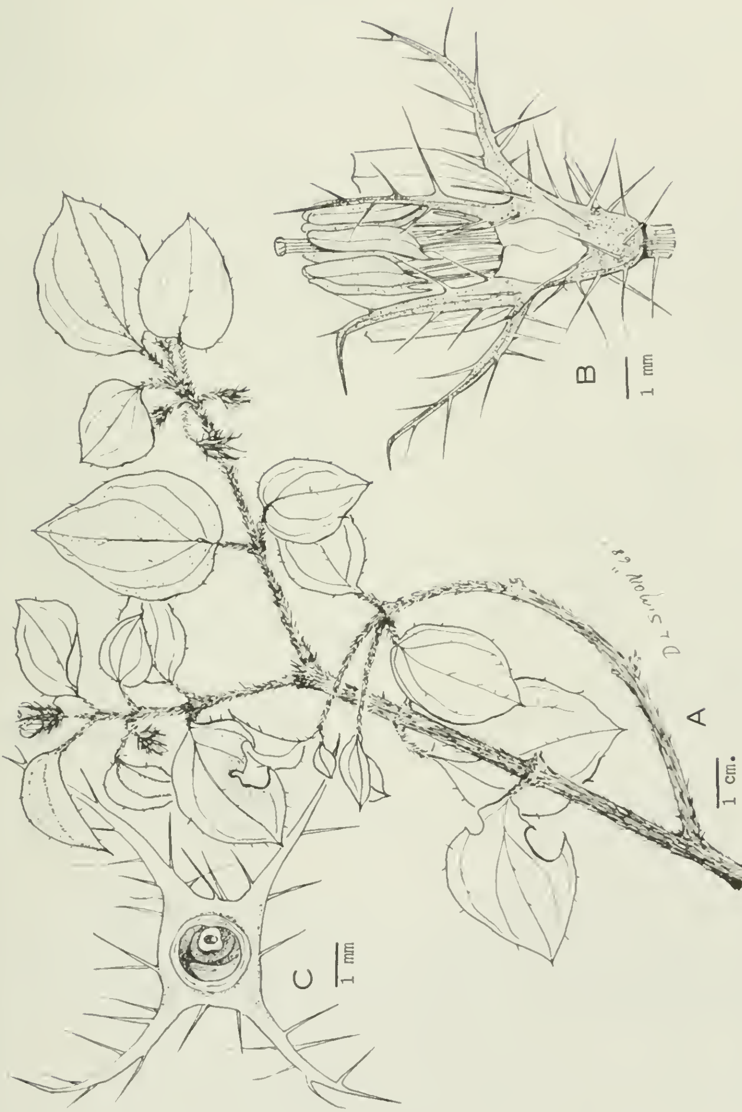
Clidemia striphnocalyx L. Wms. sp. nov.

Fruticuli epiphytici ramosi, caulibus gracilibus setoso-pubescentibus; folia ovata acuta 3-5-plinervia petiolata, petiolis setosis; inflorescentia pauciflora cymosa aut ramosa aut uniflora; hypanthium dense setosum; calyx 4-lobatum, lobis lineari-subulatis setosis; petala obovata obtusa asymmetrica; antherae 8; fructus desideratur.

Small epiphytic, much-branched shrubs probably less than 5 dm. tall; stems slender, mostly less than 1.5 mm. in diameter, densely covered with closely appressed stiff setose trichomes about 0.5-1 mm. long, becoming glabrous with age; leaves mostly broadly ovate, acute, 3-5-plinerved, ciliate, glabrous above or nearly so, appressed setose pubescent below on the nerves and also with obscure hairs on the surface and on the setose hairs, petioles to 10 mm. long, setose, blades of a pair usually somewhat anisophyllous, 1.5-3 cm. long and 1-2 cm. broad or sometimes smaller; inflorescence 1-3-flowered axillary or terminal cymes or racemes, these shorter than the subtending leaves; hypanthium obovate, becoming hemispheric at maturity, densely covered with reddish spreading setose hairs to about 3 mm. long; calyx lobes 4, linear-subulate, 3-4 mm. long, each with several setose hairs to 2 mm. long; petals narrowly obovate, obtuse, asymmetric, about 4 mm. long and 2.5 mm. broad, pale violet; anthers 8, similar, oblong and about 2-2.5 mm. long, short-spurred dorsally at the attachment; mature fruits not known, probably fleshy.

Costa Rica: epiphytic shrublet, four pale violet petals, sepals and fruit dark violet-red; disturbed primary forest high over Río Grande de Orosi, 8 km. south of Tapantí, province of Cartago, 7 May 1967, *Roy W. Lent 932* (type, F; EAP, US; MICH).

A stricking species of *Clidemia* somewhat related to *C. reitziana* Cogn. & Gleason but with very much smaller leaves, different pubescence on the stems and leaves and different flora detail.



Clidemia striphnocalyx. A, a branch; B, a flower from the side; C, calyx and ovary from above.

BOOK REVIEWS

Alma L. Moldenke

"BOOK OF VEGETABLE GARDENING" by Joan Lee Faust, 282 pp., illus., Quadrangle/The New York Times Book Company, New York, N. Y. 10022. 1975. $9.95.

This popular book offers in attractive, colorful and efficient format for some 56 common vegetables and herbs: common and scientific names; colored illustrations; planting instructions in reference to seed, soil, area and location; description of growth, cutting and harvesting; major pests and diseases.

The several black/white photographs are of first quality, the more numerous color illustrations by Allianora Rosse may seen to many more pleasing but only so superficially. Closer scrutiny reveals leaf structure to be recognizable, while flowers and inflorescences are virtually amorphic color dabs. The globe artichoke's composite head is rendered in an unfamiliar deep blue. The line drawings of weeds just look weedy. There are far superior drawings and photographs long in print, as, for instance, those exquisite ones in the "Oxford Book of Food Plants" and in many Department of Agriculture publications. It seems pointless to add more unless they are better.

"Perhaps the most distinct scent of all belongs to sage, the fragrance from the foothills of the West". The sage that is _Salvia officinalis_ (illustrated) is a native of mediterranean Europe and a mint; it certainly should not be confused with the sagebrush of our dry western scrublands, a composite, _Artemisia tridentata_, when it comes to stuffing the Thanksgiving turkey or Christmas goose!

There are helpful general sections on planting and stretching the growing season, mulching, composting, watering, winter preparations and sources of help.

"EXPLORING CRATER LAKE COUNTRY" by Ruth Kirk, iv & 76 pp., illus., University of Washington Press, London & Seattle, Washington 98105. 1975. $4.95 paperbound.

The interesting accurate text and the beautiful color and black/white photographs make this book a lovely souvenir.

This account of the geology, plant and animal life, Indian and early settlement days, and descriptions of the scenic highlights is published with the cooperation of the Crater Lake Natural History Association.

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PARASICYOS MACULATUS, A NEW GENUS AND SPECIES OF CUCURBITACEAE FROM GUATEMALA

Jennie V. A. Dieterle
University of Michigan

Among specimens assembled for an enumeration of the Cucurbitaceae of Guatemala are several collections of a distinctive but apparently undescribed plant which does not fit readily into any of the genera so far recognized in the family. Its characters of united stamen filaments and solitary pendulous seeds ally it with genera in the tribe *Sicyoideae* in Cogniaux's (1916) arrangement, or the tribe *Sicyoëae* in Jeffrey's (1961, 1964), where, because of its clustered fruits and lack of nectariferous foveolae on the receptacle tube, it seems most closely related to *Microsechium* and *Sicyos*. However, it differs from *Microsechium* in having 5-petalled (not 4-petalled) staminate flowers, completely (not partially) connate filaments and spherically grouped (not radiately free) anthers. Its moderately large, rather fleshy fruits are markedly different from the dry, thin-walled, small fruits of *Sicyos*. Because of the difficulty in assigning the new plant an appropriate place in the family, I am proposing the following new genus:

PARASICYOS Dieterle, gen. nov.

Herba scandens monoecia; floribus staminatis in paniculas dispositis, corollis usque ad basim 5-partitis, petalis 5, sepalis 5, receptaculi foveolis nectariferis absentibus; staminum filamentis in columnam connatis, antheris ad apicem columnae sessilibus, sublibris; fructibus carnosis, monospermis, indehiscentibus ad apicem pedunculi aggregatis; seminibus solitariis ex apicibus loculorum fructuum pendentibus.

PARASICYOS MACULATUS Dieterle, sp. nov.

Herba monoecia scandens glabra; caules graciles, parce ramosi, sulcati; folia simplicia, membranacea, ambitu suborbicularia vel ovoidea, ca 8-15 cm. longa, supra viridia et scabridula, subtus pallidiora et laevia, lobis 3(-5) late triangularibus, lobis lateralibus plerumque subauriculatis, sinu basilare rectangulari vel elliptice; petioli graciles, ca 3-4 cm. longi; cirrhi inaequaliter 3-partiti; flores staminati parvi, flavo-vires, in paniculas 10-20 cm. longas digesti, paniculrum ramificatione in pedunculo alta; pedicelli 5-9 mm. longi, graciles, persistentes, post anthesin paulo increscentes; calycis tubus campanulatus; dentes subulati; corolla ca 5-8 mm. diametro, intus minutissime papillosa, extus glabra, segmentis ovato-triangularibus, integris; columna staminea gracilis, glabra, ca 1.5 mm. longa; antherarum loculi sigmoideo-flexuosi; flores pistillati ignoti; fructus ovoidei, in sicco ca 3-4.5 cm. longi, carnosi, indehiscentes, inermia, primum viridia pallidomaculati, demum rubelli viridimaculati, in pedunculo commune 2-aliquot subcapitati; semina solitaria, compressa, ambitu elliptica, 1.5-2 cm. longa.

Herbaceous vines, monoecious, glabrous; stems slender, sulcate, sparingly branched; tendrils usually 3-fid, proximally and unequally branched, the peduncle about as long to twice as long as the neighboring petiole. Leaves petiolate, membranaceous, suborbicular to ovate in outline, 8-15 cm. long, usually 3-lobed, the lobes triangular, the lateral lobes smaller and subauriculate, the basal sinus deeply rectangular to ovate, the upper surface deep green and scabridulous, the lower surface lighter green and smooth; margins denticulate to entire. Staminate flowers: panicles 10-20 cm. long, the branches few and borne on the upper third or less; pedicels slender, 5-9 mm. in length, long persistent after anthesis; perianth 5-merous, pale yellowish green; receptacle tube campanulate, not pitted with nectariferous foveolae; petals triangular to ovate-triangular, separate to the base, entire, more or less patent, the corolla up to about 8 mm. across, minutely papillose inside; sepals dentiform; stamens united, the filaments connate into a slender column, the anthers sessile at its apex but more or less free along their upper length; thecae sigmoid-flexuous. Pistillate flowers not seen. Fruits 1-seeded, unarmed, fleshy, ca 3-4.5 cm. in length when dry, indehiscent, green with light green spots, later brick-red with green spots, clustered 2 to several on a common peduncle about 3.5-5 cm. long. Seeds solitary, pendant from the apex of the fruit locule, ca 1.5-2 cm. long, elliptic in outline, compressed.

Type: Williams, Molina, Williams & de Molina 40205, Guatemala, Alta Verapaz, approx. 15°32' N, 90°15' W, alt. 1,200 m., cut-over and second growth forest, hills north of San Pedro Carchá, 28 January 1969 (holotype F; isotype MICH).

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New Combinations in the Coreopsidinae

T. E. Melchert

Botany Department, The University of Iowa, Iowa City

Transfers from *Cosmos* to *Bidens*

As a result of revisionary studies of the Mexican Coreopsidinae it has become evident that the primary reason *Bidens* and *Cosmos* appear to intergrade is due to the *a priori* inclusion of all annuals with beaked or rostrate achenes within *Cosmos* (sections *Eucosmos* and *Klibea*, Sherff 1955). Three of the five *Bidens* species traditionally included within *Cosmos*, *C. exiguus*, *C. blakei* and *C. steyermarkii*, occur in Guatemala. To allow their placement within *Bidens* in my treatment of this genus for the *Flora of Guatemala*, three new transfers are proposed below. Since the specific epithets *steyermarkii* and *exiguus* were used previously in *Bidens* (*B. steyermarkii* Sherff 1944 and *B. exigua* Sherff 1920), the names *alata* and and *rostrata* are chosen for these two taxa, respectively.

1. BIDENS ROSTRATA Melchert, nom. nov.

   Cosmos exiguus A. Gray; S. Wats. Proc. Am. Acad. 22:429. 1887. Type: Mexico: Jalisco, among grass and rocks, Rio Blanco near Guadalahara, June-Oct.

1886, Edward Palmer 559 (Holotype GH, Cotypes NY, Phila, US, UV).

Not *Bidens exigua* Sherff 1920.

The specific epithet *rostrata* was chosen because the blackish achenes of this species bear an elongate, flattened, olivaceous rostrum.

2. BIDENS ALATA Melchert, nom. nov.

Cosmos steyermarkii Sherff, Field Mus. Publ. Bot. 22:438. Type: Guatemala: Chiquimula, Montana Castilla, vicinity of Montana Cebollas, along Rio Lucia Saso, 3 mi. s.e. of Quezaltepec, 1200-1500 m, Nov. 6, 1939, J. A. Steyermark 31341 (Holotype F, Cotype GH).

Not *Bidens steyermarkii* Sherff 1944.

The name *alata* was chosen because the achenes of this species, which are flattened and rostrate, have thick, stramineous, wing-like margins formed from coalescent tuberculae.

3. BIDENS BLAKEI (Sherff) Melchert, comb nov.

Cosmos blakei Sherff, Bot. Gaz. 82:334. 1926. Type: Guatemala: Retalhuleu, Jan. 1871, Bernoulli and Cario 1476 (Holotype Kew).

New Combinations in the *B. pilosa* Complex

With the exception of a few rarely collected endemics, the vast array of square-stemmed, white-rayed *Bidens* annuals found throughout Mexico and Central America have traditionally been treated as part of a single, highly variable species, *B. pilosa*. In his treatment of *Bidens* for the flora of North America, Sherff (1955), using herbarium materials only, recognized six loosely defined, ray-size and leaf-form varieties within *B. pilosa*. In a recent, yet unpublished, Ph.D. thesis, Robert Ballard (1975), combining evidence from field, cytogenetic, comparative biochemical and hybridization-breeding system studies, concluded that the Mexican "*B. pilosa*" populations conservatively include 5 specific and 6 subspecific taxa. Five of these taxa (3 species, 2 varieties) are known from Guatemala. In order that Ballard's treatment can be followed in the *Flora of Guatemala*, the following three new combinations are presented with his consent.

1. BIDENS ODORATA var. CALCICOLA (Greenman) Ballard, comb. nov.

   Cosmos pilosus H.B.K. Nov. Gen. & Sp. 4:241. 1820.

Bidens exaristata DC. Prodr. 5:600. 1836. TYPE: MEXICO: Tamaulipas: between Victoria and Tula, Nov 1830, Berlandier 2220 (Holotype: Geneva, Cotype: Paris, GH).

Bidens brachycarpa DC. Prodr. 5:600. 1836. TYPE: MEXICO: Tamaulipas: Tampico, 1827, Berlandier 5 (Holotype: Geneva, Cotype: Paris).

Bidens rosea Schultz-Bip. in Seem. Bot. Voy. Herald 308. 1856.

Bidens rosea var. calcicola Greenman, Proc. Am. Acad. 41:264. 1905. TYPE: MEXICO: Morelos: At an altitude of about 1225 m, on limestone hills, Yantepec, near Cuernavaca, 21 Oct 1902, Pringle 11340 (Holotype: GH!).

Bidens pilosus var. S brachycarpus O.E. Schulz, Symb. Ant. 7:138. 1911.

Bidens pilosa var. calcicola (Greenman) Sherff, Bot. Gaz. 80:337. 1925.

Bidens orendainae M.E. Jones, Contr. W. Bot. 18: 82. 1933. TYPE: MEXICO: Jalisco: Orendain, 27 Nov 1930, Jones 27770 (Holotype: POM! isotype: RSA! US!).

Bidens barrancae M.E. Jones, Contr. W. Bot. 18:82. 1933. TYPE: MEXICO: Jalisco: La Barranca, Guadalhara, 23 Nov 1920, Jones 27757 (Holotype: POM!).

2. BIDENS ALBA var. RADIATA (Schultz-Bip.) Ballard, comb. nov.

Coreopsis leucanthema L. Cent. I. 29 (Excl. syn. Tournef.) 1755.

Coreopsis coronata L. Sp. Pl. ed. 2. 1281. 1763. (ex syn. Vaill. and Plum., but not to descr. or type locality.)

Coreopsis leucantha L. Sp. Pl. ed 2. 1282. 1763.

Kerneria tetragona Moench, Meth. 595. 1794. (ex descr.)

Bidens leucantha Willd. Sp. Pl. 3:1719. 1804.

Kerneria leucantha Cass. Dict. Sci. Nat. 24:398. 1822.

Bidens abortiva Schum. & Thonn. Beskr. Guin. Pl. 381. 1827. (ex descr.)

Bidens adhaerescens Veil. Fl. Flum. 348, pro parte. 1827.

Bidens striata Sweet. Brit. Fl. Gard. pl. 237. 1828.

Bidens oxyodonta DC. Prodr. 5:600. 1836.

Bidens leucantha B Meyen & Walp.; Walp. Nova Acta Acad. Leop. -Carol. 19 (Suppl. 1):271. 1843.

Bidens pilosa f. radiata Schultz-Bip. Flora 27: 673. 1844. (ex syn. B. leucantha Willd., excl. Krauss' spec.)

Bidens pilosa var. radiata Schultz-Bip. in Webb

& Berth. Phyt. Canar. 2:242. 1844. TYPE: not exactly stated, but somewhere in America.

Bidens pilosa var. β leucantha Harv.; Harv. & sound. Fl. Cap. 3:133. 1864.

Kerneria pilosa α radiata Lowe, Man Fl. Madeira 1:474. 1868.

Bidens pilosus α leucanthus 1. subsimplicifolicus Kuntze, Rev. Gen. 1:322. 1891. (nomen nudum.)

Bidens pilosus α leucanthus 2. ternatus Kuntze, Rev. Gen. 1:322. 1891. (nomen nudum.)

Bidens pilosus α leucanthus 2. f. polosior Kuntze, Rev. Gen. 1:322. 1891. (nomen subnudum.)

Bidens pilosus α leucanthus 4. subbiternatus Kuntze, Rev. Gen. 322. 1891. (nomen nudum.)

Acocotli quahuahuacensis Hernandez; Altam. Mat. Med. Mex. 2:154. 1898.

Bidens pilosa var. humilis Walp.; Reiche, Anal. Univ. Chile 112:153. 1903.

Bidens leucanthema E.H.L. Krause in Sturm, Fl. Deutsch. ed. 2. 13:159. 1905.

Bidens pilosa subvar. α radiata Pitard: Pitard & Proust, Iles Canar. 226. 1908.

Bidens wallichii var. albiflora Maxim.; Matsum. Ind. Pl. Jap. 2:631, as syn. 1912.

Bidens pilosa var. albiflora Maxim.; Makino, Iconogr. Pl. Nippon 15:pl. 58. 1912.

3. BIDENS BIGELOVII var. ANGUSTILOBA (DC.) Ballard, comb. nov.

Bidens anthriscoides var. angustiloba DC. Prodr. 5:601. 1836. TYPE: MEXICO: Berlandier 1010 (Holotype: Herbarium of the British Museum, Cotype: Herb. Drake, Paris).

Bidens duranginensis Sherff, Bot. Gaz. 70:90. 1920. TYPE: MEXICO: Durango: west side of Iron Mountain, vicinity of city of Durango, April-Nov 1896, Palmer 756 (Holotype: GH! Isotype: US! MO! F! NY! C!).

Bidens bigelovii var. pueblensis Sherff, Bot. Gaz. 88:287. 1929. TYPE: MEXICO: Puebla: vicinity of Puebla, Oct. 1908, Arsene 7211 (Holotype: US).

Bidens amphicarpa Sherff, Bot. Gaz. 88:290. 1929. TYPE: MEXICO: Lower California: 23 Jan 1899, Brandegee s.n. (Holotype: UC, no. 134269).

Bidens oligocarpa Sherff, Bot. Gaz. 92:206. 1931. TYPE: MEXICO: Sonora: Sonora, 1890, Lloyd 409 (Holotype: GH!).

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Acknowledgement

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DISCOVERY OF ONE OF THE OLDEST GYMNOSPERM FLORAS CONTAINING CUPULATE SEEDS

Lawrence C. Matten, William S. Lacey, and Dianne Edwards

Department of Botany, Southern Illinois University, Carbondale, Illinois
School of Plant Biology, University College of North Wales, Bangor, Wales
Botany Department, University College of South Wales and Monmouthshire, Cardiff, Wales

Abstract. A number of petrified and compression specimens of stems, fronds, and seeds have been found in the Uppe Old Red Sandstone of southwest Ireland. To date, the seeds are the second oldest to be discovered. The seeds, identified as Hydrasperma, are cupulate and suggest the possibilit that abscission between the seed and its cupulate stalk accounts for non-cupulate remains of this genus.

In 1973, remains of a number of petrified seeds were col lected from the Upper Old Red Sandstone of Kerry Head, Irelan (1). The Upper Old Red Sandstone transgresses the Devonian-Mississippian boundary (2) and the seeds are probably lowest Mississippian (Tournaisian) in age. Only one other seed Archaeosperma arnoldii, is older than the seeds from Kerry Head (3). Three of the seeds were found attached to cupules and all are referable to a single species, Hydrasperma tenuis Long (4). In association with the seeds are petrified remain of stems and fronds of primordial gymnosperms that are referr to the group generally called seed ferns.

The Hydrasperma seeds are radiospermic and orthotropous (Fig. 1). The integument is fused to the nucellus up to the level of the plinth forming ridges on the ovular surface. Th eight integument segments are free above the plinth, extendin about 1 mm and not forming a micropyle. The total length of the seed is up to 3.5 mm and the width up to 1 mm.

The cupule of Hydrasperma consists of terete dichotomizi axes that appear to be a unit on a larger morphologic entity, perhaps a lateral branch system or megaphyll. The base of th cupule is a single terete axis that dichotomizes at least three times producing eight separate and terete to oval (in transection) lobes. The cupule lobes bear and surround a pai of seeds (Fig. 2).

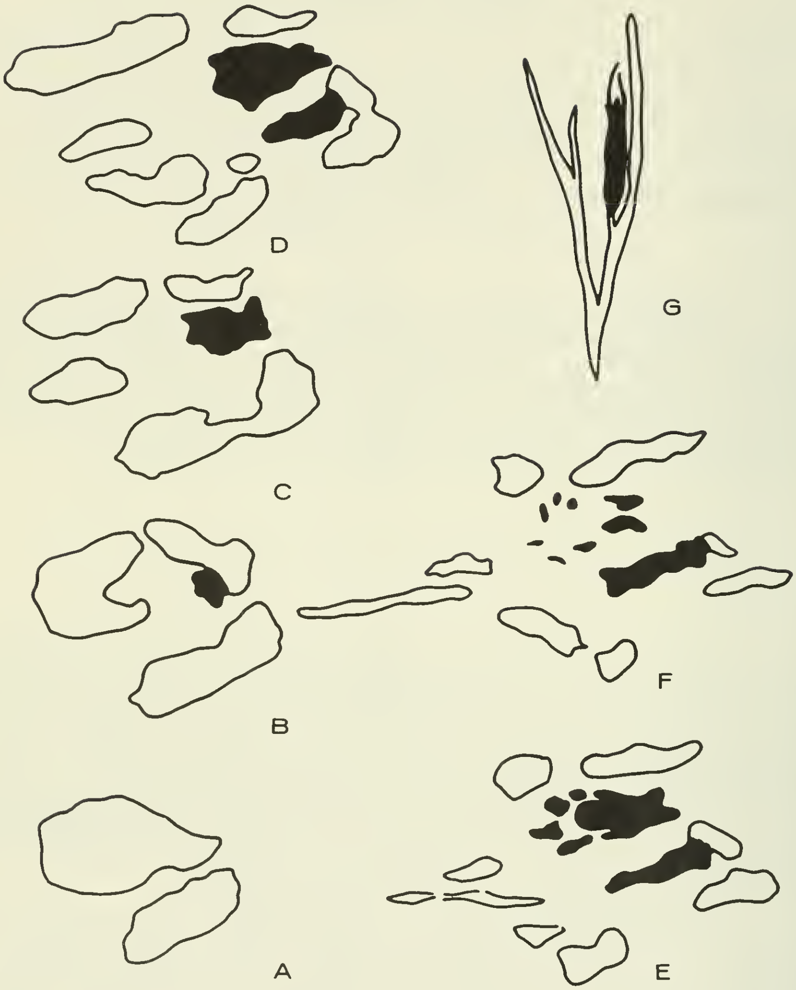

Fig. 1. Hydrasperma tenuis from Kerry Head, Ireland. A-F represent serial transections of a cupulate specimen (Southern Illinois Paleobotanical Collection, B7. 16-21). The darkened portion represents the seeds. G represents a longisection through a cupulate specimen (SIPC B7 ls).

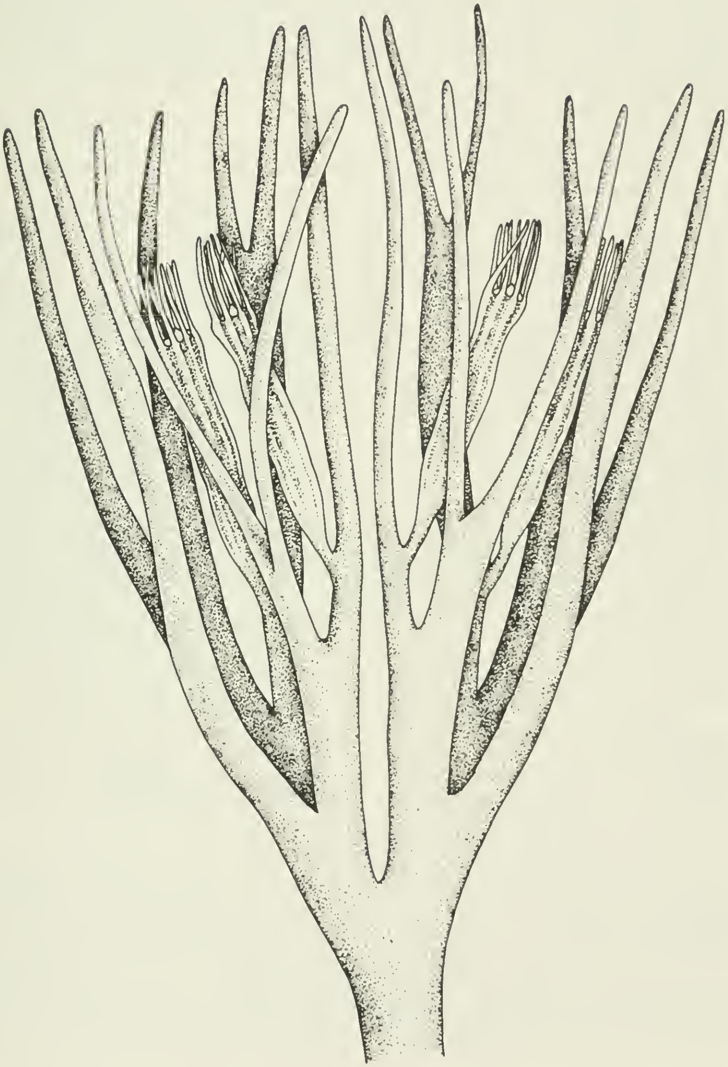

Fig. 2. Reconstruction of cupules of Hydrasperma tenuis.

Besides the oldest seed, Archaeosperma, and Hydrasperma, only nine other structurally preserved species of cupulate seeds are known (5): Gnetopsis elliptica, Lagenostoma lomaxi, Sphaerostoma ovale, Calathospermum scoticum, Tyliosperma orbiculatum, Geminitheca scotica, Calathospermum fimbriatum, Stamnostoma huttonense, and Eurystoma angulare. Of these, Calathospermum has many seeds per cupule, Sphaerostoma, Lagenostoma, and Tyliosperma have one seed per cupule, and Gnetopsis, Stamnostoma, Geminitheca, and Eurystoma have two to four seeds per cupule. In addition, compressions of the oldest seed, Archaeosperma, show two seeds per cupule (6).

Of the three groups of cupulate seeds, the one with two to four seeds per cupule appears to represent the most primitive condition. The oldest seeds (stratigraphically) occur in the group (Archaeosperma, Hydrasperma, Stamnostoma, Eurystoma). The cupular units are generally terete and show little or no fusion of parts. Long (5) interprets the cupule in this group as representing only part of a frond. The evolution of the cupulate seed in this group is thought to have occurred in the following manner: 1) fertile, lateral branch system became overtopped. The lateral branch system consisted of axes branching in several planes. The seed-bearing portion of the system consisted of axes with terminal ovules and sterile units. 2) Accretion of the sterile units around a few ovules (2-4) resulted in early cupular units (Hydrasperma, Eurystoma). 3) Planation (having the cupular units develop at the same level and to the same degree) and some webbing followed (Stamnostoma, Archaeosperma). 4) Parallel to the cupule development was the planation and webbing of the remainder of the lateral branch system to form the frond. The frond thus developed simultaneous with or immediately after the appearance of the cupule. It should be noted that Long (5) interprets the Calathospermum cupule as representing an entire frond. This is not surprising as the contemporaneous development of cupules in several genera probably indicates a polyphyletic origin of this organ.

In addition to the primitive nature of the cupule in Hydrasperma, the seed shows a number of primitive characters. The most obvious is the lack of a definite micropyle. This condition is also present in Genomosperma kidstoni. The presence of free integument lobes above the level of the plinth is a second primitive character.

The occurence of Hydrasperma tenuis seeds without cupules in the Scottish lower Carboniferous leaves several unanswered questions. Is it possible that the Irish cupulate Hydrasperma and the Scottish non-cupulate Hydrasperma are different taxa? If not, did the Hydrasperma seeds have a natural means for dispersal? Such a means would be abscission of the seed stalk. This would help explain the difference between the Irish and Scottish specimens. The possibility of abscission then leads one to the natural question about how many other non-cupulate lower Carboniferous seeds are really

the abscissed part of a cupular complex. In our opinion, Genomosperma is a likely candidate.

The petrified seeds from Ireland have thus helped us visualize some of the problems involved in the interpretation of the early evolution of the seed. In addition, the petrified remains of seed fern stems and petioles (now being studied) may help us reconstruct one of the earliest seed plants to inhabit our green Earth.

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1. The impetus for the collecting trip was the find of some petrified remains from this area in the collections of the Royal Scottish Museum. We would like to thank Dr. C.D. Waterston, Department of Geology for the loan of the specimen and for his help during the initial phase of this work.
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A NOTE CONCERNING TWO FLOWERING PLANTS

Fred A. Barkley W.
Departamento de Biologia, Universidad
Nacional Autonoma, Tegucigalpa, Honduras

In the preparation of a new edition of the "Orders and Families of Anthophyta" two taxa were encountered which the writer considers are sufficiently distinctive to be considered as families. Since the writer does not want new names to appear in this edition, these two names are presented here.

LIRIODENDRACEAE _fam. n._, Order Magnoliales.

Arbor; foliis alternis, truncatis; floribus solitariis, terminalibus; fructibus samaris.

Trees with leaves alternate, lobed, broadly truncate at apex; flowers solitary, terminal; sepals three, petaloid; petals six, upright; stamens numerous with extrorse anthers; fruit a cone of many samaroid carpels; testa adherent to the endocarp, arilloid.

An old taxon, with a single genus in the modern flora: _Liriodendron_ L., previously assigned to the Magnoliaceae Juss.

SALAZARIACEAE _fam. n._, Order Lamiales.

Frutex; ramis cylindricis; caulis ramificatus intricatis; corolla bilabiata; stamina quatuor; calyx bilobulatus, vesicarius non gibbosus, inaperto post anthesin.

Shrubs with cylindric, intricately branched stems that become spiny-tipped; leaves small, oblong, short-petioled; flowers perfect, subsessile in the axils of the upper bract-like leaves, purplish, gamopetalous; corolla bilabiate; stamens four; calyx two-lobed, not gibbous, inflated, closed after anthesis, then more than 12 mm in diameter.

In chaparral of desert washes, rocky ravines, clay flats, and hillsides, Utah to southern California, western Texas and northwestern Mexico.

Monotypic: _Salazaria_ Torrey (_Salizaria_ A. Gray), with a single species: _Salazaria mexicana_ Torrey.

Betula uber (Ashe) Fernald Rediscovered in Virginia

Clyde F. Reed

Reed Herbarium, Baltimore, Maryland
Fellow, Smithsonian Institution

After several visits to the Sugar Grove - Rye Valley Area of Smyth County, Virginia, the author has been able to relocate the type locality of *Betula uber* (Ashe) Fernald. On a trip from August 14 through August 16, 1975 in an area which took me from Trout Dale to Sugar Grove, over Iron Mountain in Grayson County and then down Dickey Creek to Sugar Grove to Sugar Grove, Teas and the Old Rye Valley Station area (now Sugar Grove), the author came to the conclusion that the original label was either incorrect or too general. In some respects it has proven both.

Betula uber (Ashe) Fernald, according to data on the label, selected by Mazzeo (1974) as the lectotype, is given the following type locality: "On bank of stream, small tree, at foot of mountain, 20-25 ft. tall, Dickey Creek, end of Florence Maybrick tract, 4 mi. south of Rye Valley Station. Smyth Co., Virginia. January 14 (corrected to June by Fernald in 1945), 1914". These specimens were named *Betula lenta* var. *uber* Ashe in 1918 (Rhodora, 20: 64. 1918).

When Fernald (1945) raised the variety to a species, he cited another specimen, labelled "Along Cressy Creek. H.B. Ayres", without date, but it was either collected at the same time as or earlier than the specimens cited by Ashe. Whether Ayres collected all the specimens cited by Ashe, or whether Ayres and Ashe collected them together, is not clear. The description of *Betula lenta* var. *uber* appears abruptly at the end of an article dealing with a variation of *Betula papyrifera* from North Carolina, which is discussed at length in a manner typical of Ashe. Then, without any introduction or discussion, either before or after, at the end of this article, appears the description and locality data given above for *B. lenta* var. *uber*. "Uber" means fruitful, referring to the many spent fruiting cones on the twigs of the type specimens. Since all specimens are in full green-leaf and the fruiting cones are dead-ripe, dropping seeds, the date of collection is surely June, not January.

Horace Beemer Ayres (Amer. Men of Science, 1: 12. 1906; 2: 17. 1910; 3: 24. 1921), born in Allamuchy, New Jersey, Sept. 20, 1856, and receiving his B.S. degreee at Lafayette College in 1878, was a geologist and timber inspector, mainly in the Engineering Department of the Northern Pacific RR. Co.; he lived in Kimberly, Minnesota most of his life and worked from there. He also worked for the Minn. & Pacific RR., the St. Paul and D. RR. At some time he was a field assistant to the U.S. Geological Survey and a forest expert to the Bureau of Forestry, USDA; he was supt. of Kimberly Explor. Co. As forestry assistant to Southern Appalachian Forestry, he published "The Southern Appalachian Forests" with W.W. Ashe in 1905. He also worked on Cascade Mt. forests, northern Rocky Mts. forests, and the Jack Pine in the Great American Desert. See references for additional publications of H.B. Ayres. All of these have been seen by the author in the Eisenhower Library, Geology section, Johns Hopkins University, Baltimore, Maryland.

Florence E. Maybrick in 1914 resided in Grayson Co., Virginia, and along with Carrie E. Rogers, Wm. E. Milne and S.V. Hayden, as co-trustees, owned about 150,000 acres of land in Grayson, Wythe and Smyth Counties, Virginia, from Iron Mountain, along both sides of the New River, ending to the north at the foot of the mountains on Cressy and Dickey Creeks. This same tract of land granted to George Lawrence by letters patent of Commonwealth of Virginia on 13 July, 1796. Other lands purchased by Florence E. Maybrick in 1916 from Albertina W. Coe, widow of John W. Coe, and family; or sold to June L. Harman of Speedwell in 1916 for operating and removing timber, barks and products for 10 years.

On August 15, 1975, after much searching along Cressy Creek, about 1.5 miles south of Sugar Grove P.O., along Flat Ridge Road (Rt. 601), on the lands of Garland Ross, Ray Haulsee and Virgie Haulsee, I found a small grove of *Betula uber*, about 10 to 12 trees, 17-21 feet tall, with all the major branches high up in the trees, practically branchless for the first 12-15 feet. Most of the trees are very near the bank of Cressy Creek, which at this point is about 12 feet across, rocky and with water about 1 foot deep in places. A few of the larger trees are 10-15 feet from the bank. All the trees are in an area about 60-70 feet long and 15 feet wide, and mainly on the west or south side of Cressy Creek. The soil is acid, pH about 6.7, overlying reddish clay, now covered with thin humus and alluvium. A few large to medium boulders are in the grove. Specimens collected at this time do not have cones and the young catkins have not appeared yet. All trees seem to be sterile.

From the specimens collected August 15, 1975, the following additional observations as to the description and anatomy of *Betula uber* can be made.

Betula uber (Ashe) Fernald, Rhodora, 47: 325, pl. 974, figs 1-5. 1945.
Syn.: *Betula lenta* var. *uber* Ashe, Rhodora, 20: 64. 1918.

Small slender trees 5-9.9 m. tall, 7.35 - 21 cm. DBH, with blackish-brown rather thin (2-4 mm. thick) trunk bark, relatively smooth; inner bark lighter, aromatic with flavor and odor of birch or wintergreen oil; twig bark blackish, smooth, with occasional large roundish lenticels; internodes on main twigs about 2 cm. apart, those on ultimate short-shoots very close, practically contiguous, with few (2-7) leaves produced per year; buds 4-6 mm. long, scales ovate in lower half, becoming gradually to abruptly pointed, chestnut-brown with a whitish to light tan fringe of scaly hairs along upper margin; leaves dark green on upper surface, lighter green beneath, suborbicular, ovate or short elliptic, subcordate or sometimes oblique at base, rounded or very obtuse at apex; blades glabrous, 2-5 cm. long, 2-4 cm. broad, upper surface smooth with scattered white hairs 1-2 mm. long along the veins, the hairs more numerous on undersurface along the veins; petioles 0.5-1.5 cm. long, with tawny to whitish hairs 1-2 mm. long, with a slightly hairy deep sinus where petiole enters leaf-blade; margins irregularly serrate with 3-6 pairs of primary veins, the apices of teeth pointing forward or slightly recurved toward main axis of leaf, the main tips ending the primary veins with 1-2 smaller teeth below them; teeth rather deltoid with the apex sometimes abruptly pointed; pistillate aments compact, ellipsoid-subcylindric, sessile, erect, 1-1.5 cm. long; fertile bracts coriaceous, strongly ribbed, glabrous, the broad and low middle lobe and the broad lateral lobes subequal; samaras broadly cuneate, 1.5-2.1 mm. long, about 1 mm. broad, dark brown, the wing broadened upward and narrower than to nearly as broad as the nutlet.


cm
NO 98151
HERBARIUM OF CLYDE F. REED
Betula uber (Ashe) Fernald
Banks of Cressy Creek, 1.5 mi. S of Sugar Grove P.O., along Flat Ridge Road (Rt. 601), at foot of mountain, in small grove of 10-12 trees. Smyth Co., Va.
Aug. 15, 1975
Coll. Clyde F. Reed

Locality: Banks of Cressy Creek, 1.5 miles south of Sugar Grove P.O., along Flat Ridge Road (Rt. 601), at foot of mountain, in small grove of 10-12 trees. August 15, 1975. Clyde F. Reed 98151. This most probably the type locality, not the reference to Dickey Creek, as cited by Mazzeo (1974).

Sections of the wood show diffuse porous arrangement of the vessels, the vessels being solitary or in pairs. More detailed comments on the wood anatomy will be discussed later.

Other plants collected on August 15, 1975 in the close vicinity of *Betula uber* along Cressy Creek include: *Magnolia fraseri*, *Pyrularia pubera*, *Campanula divaricata*, *Betula lenta*, *Betula allegheniensis*, *Amelanchier arborea*, *Tsuga canadensis*, *Rhododendron maximum*, *Tilia americana*, *Pinus rigida*, *Menispermum canadense*, *Clethra acuminata*, *Magnolia acuminata*, *Isotrema macrophylla* and *Oxydendron arboreum*. In nearby pastures were *Euphorbia lathyrus*, *Erodium cicutarium* and *Cuphea petiolaris*.

Betula uber (Ashe) Fernald is most probably a hybrid between *Betula allegheniensis* X *pumila* var. *glandulifera*, also known as *Betula* X *purpusii* Schneid (Illus. Handb. Laubholzk., 1: 102. 1904), the Purpus Birch or Minnesota Birch. *Betula* X *purpusii* Schneid. (as *B. lutea* x *pumila*) was named for J.A. Purpus of the Darmstadt Botanical Garden, Germany, who cultivated this hybrid from material found by his brother in Michigan (Little, 1953, p. 70). *B.* X *purpusii* is a hybrid between a tree species (*B. allegheniensis*) and a shrub species (*B. pumila*), and probably accounts for the shrub-like appearance of the leaves and top of tree on a tree-like trunk. *B. uber* has inherited the wintergreen odor of *B. allegheniensis* and the leaf characters of *B. pumila*. The hybrid nature of *B. uber* is further justified by its sterility. Although the specimens collected by Ashe in 1914 show mature cones, all the specimens collected by the author on August 15, 1975 are not only devoid of signs of catkins or cones, but no scars are to be found on twigs several years old. One would not expect all hybrids to be fertile or sterile. There may be more plants in the vicinity, maybe on Dickey Creek. *B.* X *purpusii* is found in Ontario, Michigan, Wisconsin, Minnesota, Illinois and Indian, mainly in wet areas, as tamarack swamps. The description of *B.* X *purpusii* Schneid. in Trees and Shrubs of Minnesota, p. 101-102, with illustration, fits the description of *Betula uber* extremely closely, if fact, I would go so far to say *Betula uber* (Ashe) Fernald is *B.* X *purpusii* Schneid. In the illustration of plants collected on Cressy Creek August 15, 1975 by the author, there is indication of one leaf as to its being pointed. All the other leaves are not truly rounded at the apex, but the two sides seem to meet unevenly as if a common point could not be reached; no two tips are the same.

Another hybrid, *Betula* X *sandbergi* Britton (Bull. Torr. Bot. Club, 31: 166. 1904), known to be fertile to a limited degree is also found in the tamarack swamps of Minnesota, Saskatchewan and Montana. It is a hybrid between the tree species, *Betula papyrifera*, and the shrub species, *Betula pumila* var. *glandulifera*, and progeny segregate into forms more or less resembling one or the other parent. Also note description and illustrations in Rosendahl and Butters, p. 100-101.

Another hybrid, *Betula* X *jackii* Schneid., between *B. lenta* and *Betula pumila*, although said to be a hybrid known only in cultivation, could well be a possible explanation for *Betula uber*, since *B. uber* has many characteristics of *B. lenta*, especially the black non-peeling bark, blackish twigs and infrequent acuminate leaves.

In conclusion, it seems to me that *Betula uber* is a hybrid between *B. lenta* or *B. alleghaniensis* and *B. pumila* var. *glandulifera*, or possibly some other variety or form of *B. pumila*, all the above hybrids being between a tree species and a shrub species, with *B. uber* showing many features of both types of growth. For the hybrids, both *B.* X *purpusii* & *B.* X *jackii* predate *B. uber*. With controlled hybridization, the exact cross should be able to be obtained. Also comparison of *B. uber* with living and herbarium specimens of these hybrids may prove *B. uber* true ancestors.

Because H.B. Ayres lived in Minnesota and did extensive work on the Flathead Forest Reserve in Montana, I think Ayres may have planted the trees on Cressy Creek and perhaps elsewhere, when marking forest tracts, as the Maybrick tract, this location being the northern limit of that land tract on Cressy Creek. Perhaps, he did put a tree on Dickey Creek which was more fertile, but those now on Cressy Creek seem to be sterile, and to have been for some time. The fact that there is only one specimen collected and deposited by Ayres at Gray Herbarium without a date makes me believe that Ayres planted the trees. Also since Ayres along with Ashe wrote a book, The Southern Appalachian Forests in 1905, I believe the trees were planted there at this or other earlier times and then revisited by Ashe in 1914. The fact the Ashe makes no mention of the plant for four years after he collected it, and then places it on Dickey Creek, not Cressy Creek, where Ayres had said his was found, makes me believe Ashe did not know where the trees really were. However, there is the chance that there was, and may still be, a tree on Dickey Creek.

I wish to thank the following people who have been very helpful in my finding the locality for *Betula uber*, as indicated by Ashe and Ayres.

Mr. J. Richard Campbell (Marion, Va.), whose father, and later he, owned the lumbering rights to portions of Iron Mt., Pine Mt. and other tracts in Smyth and Grayson Counties. In addition to lumber taken to the Rye Valley Station area to the Teas Extract Co. where tannic acid was extracted from hemlock bark and chestnut wood, spruce, chestnut-oak and other timbers were also made into lumber. Mr. Campbell provided me with much valuable data concerning the Marion & Rye Valley RR started about 1888 for the purpose of getting out iron ore and manganese. Some manganese ore, but no iron ore, was found, and the railroad gave up. Later, with more funds, a corporation called the Marion & Rye Valley and Virginia Southern RR was founded, and the railroad built along Dickey Creek to Trout Dale and beyond, in all about 30 miles of track, for the purpose of bringing the timbers down from Iron and Pine Mts. to Sugar Grove or Rye Valley Station. Mr. William Howard Teas, a young chemist from Pennsylvania was sent by the American Leather Co. to run the Extract Co., which later was called the Teas Extract Co., and the area or town thereabout called Teas, Virginia (now an area to the northwest of Sugar Grove along Rt. 601). According to Paul Sexton (Rural Retreat in Wythe Co.), whose father was

the last supervisor at the Teas Extract Co., the extraction of tannic acid ceased about 1922 after the Chestnut Blight destroyed most of the trees. Because of the decline in production thereafter, the company moved to Nashville, Tennessee, where he and his father worked for many years. Later, Paul returned and is now retired in Rural Retreat, Virginia. Birch bark was also extracted for Oil of Wintergreen (Betula alleghenensis). After the extract company moved away and the lumbering company moved to West Virginia, the Marion and Rye Valley RR. continued to operate as a passanger and freight railroad until about 1932. In 1933-1935, a large CCC camp was located in Sugar Grove and helped to remove the RR ties and bed, and Rt. 16 was built on top of most of the railroad bed from Sugar Grove to Trout Dale along Dickey Creek. The Rye Valley Station front was removed, and now is the front of a vacant store in Sugar Grove. During the prime years of extraction of tannic acid about 250 million board feet of both hard and soft woods (mainly spruce) were cut off Iron Mt. Balsam fir was plentiful then, and was tapped (by punching the blisters under the bark) for balsam sap.

Clara Hill Carner, historian for Smyth County, Virginia, and founder of the Historical Society of Smyth County, has provided me with much history about Rye Valley, where early settlers found a type of wild rye growing. She also introduced me to the Smyth County Centennial Volume produced in 1932 by Mr. Wilson. (Smyth County was established in 1832; previously it had been part of Fincastle Co. in revolutionary days, and later part of Washington and Wythe Counties).

Sena Ward, who resides in the Sugar Grove-Teas area along Rt. 601, northwest of Sugar Grove, is writing a history of Rye Valley and loaned me photos of the Marion & Rye Valley RR., the Lead Mine (1902) and the Teas Extract Co. (1914). The Lead Mine area is still owned by relatives of Sena Ward. Also the wild rye is still growing on property owned by Sena Ward. The lead obtained here was used by Indians for arrowheads, and later for bullets by the settlers. It is interesting to note than bricks taken from the lead mine recently bear the imprint of a tiger. Dr. Schiff, son-in-law of Sena Ward, on the staff of George Washington University, has found the name of the company on one of the bricks.

Ray Haulsee and Virgie Haulsee, on whose land the Betula uber location is situated, along Cressy Creek, 1.2-2 mi. south of Sugar Grove on Flat Ridge Road (Rt. 601). Ray Haulsee land is on both sides of the road, south of the United States Forest Work Camp, and Virgie Haulsee land is to the west and south of Cressy Creek. The lower portion of the Virgie Haulsee land was purchased Nov. 21, 1947 from J.T. Hutton (widower) consisting of three tracts from the James Land, part of the Blankenbeckler land and the Warfield Church Lot, which is "on the waters of Slemps Creek, beginning on south side of Slemps Creek road in edge of Sugar Grove". (Cressy Creek runs into Slemps Creek before going on to the Holston River). (Deed Book 99, p. 241). On October 17, 1949, the land was deeded to J.W. Haulsee and Fay W. Hutton "for Fay W. Hutton to care for and provide J.W. Haulsee and Maggie Haulsee with necessities of life -- etc.", the land to be known as the John Haulsee Farm. (Deed Book 107, p. 59). The upper area where Betula uber is found now belongs to Garland Ross who purchased it from Clara Brooks Stone et vir; 'this land being the same land conveyed to J.W. Haulsee for life with remainder to Clara Brooks by Fay W. Hutton et vir (John), May 25, 1954". Rest of land to J.W. Haulsee by A.M. Haulsee et al, April 21, 1921. (Deed Book 174, p. 523). Other references to this land, see Deed Book 129, p. 110.

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MISCELLANEOUS NOTES ON NEOTROPICAL FLORA, VIII.

by José Cuatrecasas
Department of Botany, Smithsonian Institution
Washington, D.C., 20560

As in the former notes of this series, these are descriptions of new taxa in the Compositae, preliminary to the publication of forthcoming monographs in preparation. See PHYTOLOGIA 31 (4): 317, 1975. The basic work for these notes has been partially sponsored by the National Science Foundation (Grant GB. 32086).

ESPELETIA CLEEFII Cuatr. sp. nov.

Caulirosula aspectu alba vel albida. Caulis columnaris simplex erectus 1-2 m altus cum foliis marcescentibus densissime crasseque tectus.

Folia coriacea flexibilia, adulta rigida, utrinque albo vel cinereo-lanata adulta viridi-alba, 32-44 cm longa. Lamina sessilis 26-34 x 3.6-6 cm, (5.5:1-7:1) anguste elliptica seu lineari-elliptica, sublanceolata vel oblanceolata, apice acuta basim versus gradatim attenuata usque ad 1-1.7 cm lata, basi triangulari et in vaginam amplectentem ampliata; margine integra revoluta; supra spisse albo vel griseo lanata, pilis longis in pluri-spiram contortis sed extremo antrorso, valde adpressis tecta, tantum costa insuper cum pilis parallelis sericeis densis adpressisque conspicua; subtus alba vel viridi-alba, costa elevata basim versus valde incrassata et basi dilatata striato-sulcata, nervis secundariis prominentibus 5-8 (-10) mm inter se distantibus in angulo (40°-) 50-60° ascendentibus, prope marginem curvatis et in reticulum cum nervis minoribus anastomosantibus, nervis tertiis transverso-ascendentibus irregularibus prominentibus sed paulo distinctis cum nervulis minoribus reticulum minutum elevatum formantibus, alveolis profundis fundo glabro; costa cum pilis pluri-spiraliter crispis dense compressis, insuper rectis elongatis antrorsis sericeis superficiem nitidam conspicuam formantibus; reliqua nervatio cum dense indumento lanato albo, pilis patulis multi-spiram contortis intricatis, instructo, tecta sed plus minusve conspicua. Vagina late oblonga, 6-7.5 cm longa 3.5-6 cm lata; apice obtuse triangulata basim versus gradatim leviterque dilatata, crassa, argute parallele multi-nervata, abaxiale densiuscule sericeo-barbata pilis teneris antrorsis 15-18 mm longis adpressis tecta, adaxiale glabra, apice sicut basim laminae (costae dilatatae) utrinque denssisime crasseque congeste lanata et lanato-barbata. Folia juvenilia et gemmae terminales magis dense crasseque lanatae insuper aspectu

villoso-sericeae albae vel pallide aureae.

Inflorescentiae thyrsoides corymboide paniculatae, axillares folia rosularum paulo (0- 1/5) excedentes. Axis robustus erectus 30-50 cm longus; pars proximalis vegetativa 2/3 - 1/2 totius longitudinis aequans, 1-3 (-4) paribus foliis sterilibus instructus; folia decussata basi connata proximalia juxta basim inserta linearia vel oblanceolato-linearia acutaque, 14-24 x 1.5-1.8 cm, deorsum attenuata et in vaginam crassiuscule membranaceam 3-5 cm longam amlectentem ad basim tubulosam producta, altera sursum gradatim breviora 11-5 x 1 cm; pars fertilis 15-27 capitula ferens, tria in cyma terminali semper instructa cetera in 3-4 paribus ramis oppositis angulo acuto ascendentibus, erectis, disposita. Rami, 2-3 pares proximales saepe cymam 3-capituliferam producti interdum infimi 5-capitulifera, distales 2-1 capitula ferentes. Internodia proximalia 5-10 cm longa, cetera sursum: 2.5-4 cm, 1.5-3.3 cm, 1.5-1.8 cm et terminalia (pedicellus centralis) 2-4 cm longa. Rami (inflorescentiae partiales) internodia valde excedentes, proximales distales attingentes vel leviter breviores. Pedicelli elongati erecti 2-7 cm longi. Bracteae subtendentes fertiles lineares vel triangulato-lineares acutae basi amplectentes saepe connatae, quam internodia longiores sed quam rami breviores vel subaequales; inferiores 5-12 x 1-1.5 cm, ceterae sursum 3.5-6 x 1-1.5, 2.5-5.5 x 1-2 cm, 1.5 x 1.8 cm. Axes rami pedicellique dense crasseque flavo-lanati, pilis longissimis flexuosis valde intricatis tecti insuper plus minusve barbulas lanugineas vel floccosas formantibus. Folia indumento albicanti illi foliorum rosularum. Bases axium inter vaginas foliorum arcte compressi densissime crassissime albo longi-lanati.

Capitula radiata erecta vel inclinata, 143-258 (-346) flores ferentia, ligulis amotis 15-22 mm diam, circulo ligularum 24-30 mm, disco 12-15 mm diametienti. Involucrum cupulatum dense crasse intricate flavescenti-lanatum. Phyllaria sterilia exteriora plerumque quatuor 10-13 (-16) x 10-6 mm, ovata vel subrotundata basi subcordata apice subite cuspidata vel breviter acuminata acutaque, densissime longeque lanata, interiora 4-6 (-10), plerumque 10-6.5 x 7-2.5 mm longi ovata a vel ovato-acuminata acuta extus lanata vel praecipue sursum villoso-lanata. Phyllaria fertilia externa herbacea inferne crassiora 8-6.5 x 3.5-2 mm, ovato-acuminata vel anguste oblonga acuminata vel acutata plurinervata amplectentia extus lanata vel lanato-villosa pilis sursum flexuosis 3 mm, interiora magis tenera membranacea margine late scariosa amplectentiaque 7-6 x 2-1.4, rostro-dorsale brunnescente villoso-barbata vel ciliato-barbata pilis 2-1 mm longis, dorso sparsis minutis glandulis. Receptaculum moderate convexum subglabrum tantum sparsissimis minutis obsoletis pilis 0.1-0.2 mm. Paleae subscariosae hyalinae 8-10-nervatae costa elevata, anguste oblongae triangulato-acutatae amplectentes dorso sparsis minutis glandulis pediculatis, subapicem apiceque brunnescenti-barbatae vel ciliato-barbatae pilis fexuosis 0.5-1.5 mm.

Flores radii feminei 37-60 in capitulo, 3-seriati. Corolla lutea 7-12 mm longa, tubo angusto 1-2 mm longo dense piloso pilis patulis vel subpatulis obtussis crassiusculis 0.2-0.3 (-0.5) mm, sparsis vel copiosis, et pilis ascendentibus longioribus subacutis vel acutis vel subobtusis usque ad 0.8 (-1) mm longis praecipue ad basim interdum ad apicem copiosis vel densis, plus glandulis pediculatis sparsis; lamina linearis vel oblongo-linearis 5-7 nervata obtuse 3-dentata, basi acute aperta, extus minutis glandulis sparsis basi parce pilosa adaxiale glabra minutissime velutino-papillosula, 1.5-2.5 mm lata; stylus 3.5-6 mm ramulis 0.8-1.5 mm; achaenia exteriora 2-2.4 x 1.3-1.8 mm ovato-triangulata apice subtruncata dorso plano-convexo, interiora 2.5-3.2 x 0.8-1.2 mm oblonga quadrangulata vel subquadrangulata.

Flores disci pseudohermaphroditi 98-178 (-268) in capitulo. Corolla lutea 5-6 mm longa, tubulo 2-2.3 mm copiose vel tantum sursum parce piloso, pilis crassiusculis basi incrassatis (subconicis), apice obtusis, vel subobtusis, 0.1-0.3 (0.4) mm plus alteris longioribus subobtusis vel subacutis usque 0.8 mm, et parcis glandulis capitato-pediculatis minutis intersparsis; limbo tubuloso vel sursum leviter ampliato, basi parcis vel raris pilis brevivus et sparsis glandulis, lobis triangularibus subacutis margine incrassatis papillosisque extus sparsis glandulis globosis subsessilibus rare rarissimis (1-2) pilis minutis 0.2-0.3 mm obsitis. Anterae 1.8-2.2 mm longae appendice apicali 0.45 mm ovata subacuta. Stylus conico-clavatus 5-6 mm longis. Nectarium tubulosum inaequaliter dentatum 0.5-0.8 mm longum. Rudimentum ovarii 0.2-0.25 mm altum.

Typus: Colombia, Boyacá: Sierra Nevada de Cocuy: Boquerón de Cusirí, 4300 m, vert. W, superpáramo cerca del límite con páramo propiamente dicho, vegetación seca en suelos pedregosos, caulirósula 1-2m, flores amarillas, "frailejón", 6 Oct. 1972, A.M. Cleef & P. A. Florschütz 5922; holotypus, US; isotypi, COL, U. Other collections: Colombia, Arauca, Sierra Nevada del Cocuy: cabeceras de Quebrada El Playón, Patio Bolos 4250 m, superpáramo seco, cerca límite del páramo, cualirósula 1.5 m, flores amarillas, "frailejón: 12 Mar. 1975, A. M. Cleef 9100 (paratypus, US; isoparatyi, COL, U). Id. id. El Playón, Hoya San José cerca La Botella, páramo húmedo con Chusquea sp., 3550 m, 2 km WNW de finca El Playón, caulirósula 1 m, hojas verdosas, lígulas amarillas, 9 Jun 1973, A. M. Cleef 10114 (US, COL, U); id. id Q. El Playón, Hoya San Luis, 3500 m, vegetación paramuna seca sobre morrenas, caulirrósula 1 m flores amarillas, 13 Mar 3500, A. M. Cleef 9170 (US, COL, U); id. id. Hoya San Luís, 3860 m, páramo relativamente seco, asoc. con Chusquea, Vaccinium floribudum y criptógamas, suelo arenoso, caulirósula 1 m. hojas verdosas, lígulas amarillas, 11 June 1973, A. M. Cleef 10179 (US, COL, U)

ESPELETIA ANNEMARIANA Cuatr. sp. nov.

Caulirosula visu viridi-cinerea, caule 10 cm diam usque ad 2 m alto cum foliis marcescentibus spisse obtecto. Rosula foliorum densa circa 60-70 cm diametro.

Folia coriacea crassiuscula rigidula utrinque lanata sessilia, adulta 40-50 cm in tota longtudine, 6.5-10.5 cm lata. Lamina anguste elliptica vel anguste obovata apice subite vel gradatim attenuata semper acuta deorsum plus minusve longe gradatim angustata ad basim subite vel gradatim contracta, 32-43 cm longa (6.5-)7-9.5(-10.5) cm lata (3:1-5:1) margine integra valde rigideque revoluta, costa ampla robusta supra sursum fere plana deorsum leviter carinata basim versus sulcato-striolata, subtus valde prominenti semitereti, lateraliter sulcata, nervis secundariis 7-10 mm inter se distantibus abaxiale prominentibus bene conspicuis inaequaliter parallelis angulo 55-60° (50-65°) ascendentibus, prope marginem arcuatis anastomosantibus, nervis tertiis abaxiale conspicuis oblique transversis cum nervis minoribus etiam prominentibus reticulum minutum bene elevatum formatibus; adaxiale superficie crasse densissime adpresseque albo-lanata pilis 5-10 mm longis basi crassiuscula patula ceterum bi-spiraliter contortis sed extremo valde longo subrecto vel arcuato horizontale subadpresso in foliis vetustis saepe congeste crasse crispolanato; abaxiale pilis similibus sed magis contortis intricatisque lanam magis mollem floccosam formantibus, reticulo obtecto, fundo alveolorum pilis brevibus sericeis copiosis obsitis, costa etiam lanata saepe insuper villoso-barbulata instructa. Vagina crassa coriaceae late trapezialis vel ovata vel late semiovata 6-8 (-9) cm longa 6-8 cm lata, multi paralleli-nervata, adaxiale glabra, abaxiale densissime longeque albo-fulvido-barbata pilis tenuissimis subsericeis rectis antorsis 15-20 mm longis valde adpressis instructa. Gemae inflorescentiae et folia juvenilia densissime albo-villoso-lanata et insuper albo-villoso-barbata superficiebus adaxialibus plus minusve sericeis.

Inflorescentiae thyrsoides axillares saepe numerosae, maturitae folia rosularia aequilongae vel breviores. Axis 30-47 cm longus robustiusculus erectus, dimidia vel tertia (vel quarta) parte proximali vegetativa 12-23 cm longa aphylla, longe crasseque albo-lanato-barbatus; pars distalis fertilis ramosa bracteata 19-13 (-5) capitula ferens, tria in cyma terminali semper instructa, cetera in 4-3 (-2-1) paribus ramorum oppositorum ascendentium disposita; internodia longitudine parum decrescentia [(12-)8-3.5 cm], terminale seu pedicellus centralis 3-5.5 cm longus. Rami proximales infimi cyma 3-capitulifera instructi in toto 14-27 cm longi, alteri etiam cymosi aut monocephali ceteri monocephali, omnes sursum gradatim breviores et internodia valde (saepe duplo) superantes. Rami intermedii monocephali

(=pedicelli) erecti maturitate 14-7 cm longi, pedicelli infimi ad 10 cm longi supremi 3.5-6 cm longi. Rami pedicellique robustiusculi striati crasse molleque crispo et barbato-lanati albi vel sursum ochroleuci. Bracteae subtendentes foliaceae oppositae sessiles basi breviter connatae, lineares acutae infimae 20-10 x 2.5-1.5 cm sursum gradatim breviores late ovato-lanceolatae amplectentes, supremae 3-2.5 x 1.5-1 mm omnes longiores quam internodia sed valde minores quam pedicelli, texturae et indumento foliis similiter, lana dense molle longe albo-barbata tectae.

Capitula radiata latiuscula suberecta vel cernua, 200-400 flores ferentia, ligulis amotis 2-2.5 cm diametientia, circulo ligularum 26-35 mm, disco 18-22 mm diametro. Involucrum cupulatum dense canescente lanatum, expansum 35-45 mm diametro. Phyllaria sterilia herbacea crassiuscula, exteriora 4 vel 3, ovata plus minusve acuminata subacuta, longe dense crasseque lanata, 15-20 x 8-12 mm, intus acumine utrinque longe lanato-villoso excepto glabra inconspicueque nervata, interiora 5-12, 1-2-seriata, ovato-oblonga vel sublanceolato-oblonga, apice acuta, 15-9 x 9-4 mm, extus lanata vel lanuginosa sed intima utroque latere glabrescentia. Phyllaria fertilia exteriora herbacea lanceolato-oblonga vel oblonga acuta 12-8 x 5.5-2.8 mm, dorso sursumque villosa et barbata pilis 2 mm longis et glandulis breviter pediculatis obovoideis copiosis, interiora amplectentia subscariosa 8-7.5 x 2.5-2 mm, tantum dorso apicale barbata pilis 1-1.5 mm, et glandulis obovoideis praedita. Receptaculum convexum glabrum 10-13 mm diametro, 2-3 mm altum. Paleae 6.5-7 x 1.8-2 mm, scariosae subhyalinae ovali-oblongae acutae basi incrassatae, plurinervatae costa magis notata, amplectentes, distale brunneo-barbulata ciliataque pilis ad 1 mm longis et sparse minuteque subgloboso-glandulatae.

Flores radii feminei 50-105 in capitulo 3(-4) seriati. Corolla lutea 8.5-12 mm longa, tubo 0.8-1.3 mm densiuscule patulo-piloso pilis obtusis vel obtusiusculis 0.2-0.5 mm longis raro raris pilis longioribus vel acutis obsitis; lamina lineari-oblonga apice obtusa vel subtruncata plerumque 3-dentata dentibus obtusis, 5-9-nervata plerumque duobus nervis robustioribus, adaxiale glabra, abaxiale sparse vel copiose minuteque pediculato-glandulosa, et ad basim sparsis pilis obtusis brevibus. Stylus 3.5-5 mm longus ramis linearibus 1-1.2 mm longis. Achaenia exteriora late obovoidea triangulata subtruncata dorso leviter convexo, 2.5 x 1.6-1.8 mm, interiora magis oblonga subquadrangulata, 2.7-3 x 1-1.6 mm.

Flores disci pseudohermaphroditi 152-337 in capitulo. Corolla lutea 6.5-7 mm longa tubulo 2.3-2.8 mm longo sparse vel copiose piloso, pilis patulis crassiusculis obtusis 0.2-0.5 mm longis et parcis glandulis, limbo tubuloso ampliato, leviter infundibuliflormi basi parcis pilis vel glandulis; lobis 1 mm altis triangularibus margine adaxiale papillosis extus saepe parce barbulatis pilis tenuibus acutis leviter flexuosis antrorsis 1 mm longis, et glandulis breviter pediculatis

obovoideis sparsis munitis. Anterae 2.2-2.5 mm longis sagittatis appendicibus ovato-oblongis 0.5 mm longis. Stylus 6.5 mm, sursum papilloso-hispidulus. Nectarium 0.7-1.2 mm tubulosum dentatum.

Typus: Colobia, Boyacá: Alto de Mogotes, carretera Vado Hondo-Labranzagrade 3300 m, supáramo con gramíneas y muchas hierbas, suelo arenoso, cualirósula 1 m (pocas veces 2 m) tronco 10 cm diam, flores amarillas, 2 Apr 1973, Antoine M. Cleef 9296; holotypus, US; isotypi, COL, U). Other collections: Vado Hondo, Siberia entre Peña Arnical y Alto de Mogotes, páramo relat. seco 500 m S-SE de Laguna Grande, 3330 m alt., assoc, con Chusquea y Calamagrostis effusa, caulirósula 0.5 m, hojas verdosas, lígulas amarillas, 10 Apr 1973, A.M. Cleef 9556 (US, COL, U). Peña Arnical, N de Vado Hondo, 3630 m, páramo húmedo con Chusquea, Calamagrostis e Hypericum sobre lajas, caulirósula 1 m, flores amarillas 6 Apr 1973, A.M. Cleef 9453, 9453A (US, U, COL)

Espeletia annemariana is dedicated to Mrs. Annemarie Cleef, enthusiastic and efficient field collaborator of Antoine M. Cleef in his paramo ecologic studies.

ESPELETIA ANNEMARIANA VAR. RUPICOLA Cuatr. var. nov.

Lammina foliorum elliptica vel obovato-elliptica apice subite acutata apiculata, basim versus attenuata, basi valde contracta brevissime subpetiolata, 22-25 x 7.8-8.5 cm (2.6:1-3:1), nervis secundariis 5-9 mm distantibus angulo 55-65°, utrinque densissime crasseque lanata. Vagina foliorum 6-6.5 x 5.5 cm. Inflorescentiae quam folia valde breviores, circa 21 cm longae, 2/3 parte vegetativa exfoliata, 1/3 distali parte thyrsoide 5-capitulifera, dense crasseque lanatae insuper villoso-barbatae. Capitula 2-2.5 cm diametientia, circulo ligularum 30 mm, disco 17 mm diam. Phyllaria sterilia 9-10, ovato-oblonga attenuata acuta 15-10 x 9-3 mm, extus dense longeque luteolo-lanata, interiora oblonga; fertilia exteriora 9-8 x 4-3.5 mm oblonga acuta, interiora 8 x 2.5 mm, dorso antrorso-piloso margine hyalina apicem barbulata and sparse glandulifera. Paleae 6.5 x 1,8 mm subite oblongo-acuminatae dorso apice fusco-ciliato-barbatae et sparse glanduliferae. Flores radii feminei circa 72, 3-4-seriati, corolla 8-8.5 mm tubo 1.2-1.5 mm piloso et glanduloso, lamina 1.8 mm lata 7-nervata abaxiale copiosis glandulis subsessilibus. Achaenia 2.2-2.3 x 1.5-1.6 mm, obovato-triangulata, interiora 2.5 x 1.5-1 mm oblonga quadrangulata. Flores disci 186, corolla 6 mm tubo parcis pilis et glandulis, lobis 0.7-0.8 mm altis abaxiale copiosis glandulis subglobosis breviter pediculatis.

Typus: Colombia, Boyacá: Peña Arnical, N de Vado Hondo, crece en grietas de rocas, 3600 m, caulirósula 1.5 m, flores amarillas, frailejón, 6 Apr 1973, Antoine M. Cleef 9466; holotypus, US; isotypi, COL, U.

ESPELETIA CABRERENSIS Cuatr. sp. nov.

Caulirosula visu albo-cinerea vel viridi-cinerea, caule brevi, rosula lata.

Folia coriaceae firma utrinque spisse lanata, pseudopetiolata 61-65 cm longa. Lamina anguste lineari-lanceolata apicem versus gradatim angustata, acuta, basim versus sine sensu attenuata et in pseudopetiolum angustata 47-50 cm longa 4-4.5 cm lata (10:1-12:1) margine integerrima revolutaque, costa valde robusta supra plana sursum parum notata; subtus crasse eminenti argute costulato-striata sulcataque, nervis secundariis adaxiale invisibilibus abaxiale bene notatis, prominentibus inaequaliter parallelis inter se 5-10 mm distantibus angulo 40-50° ascendentibus, prope marginem arcuato anastomosatis, nervis tertiis parum distinctis oblique transversis cum nervulis minoribus reticulum elevatum minutum formantibus; utrinque albida vel viridi-albida vel viridi-cinerea adaxiale pilis densis patulo-arcuatis spiratim contortis lanato-intricatis sed extremis subrectis subparallelis superficiem leviter sericeam formantibus, abaxiale crassius vellerea pilis patulis inferne erectis plurispiraliter flexuosis, intricatisque lanam mollem insuper plus minusve barbulatam formantibus; reticulo occulto alveolis profundis cum pilis tenuibus minutis praeditis; costa densissime induta pilis valde longis (15-20mm) geniculato-arcuatis extremis subparallelis insuper ad modum fibras longitudinales adpressas formantibus. Pseudopetiolus 6-8 cm longus, 0.8-1 cm crassus, costa robusta costulato-sulcata, angustissime cum margo laminae revoluto decurrentique marginatus, utrinque densissime lanatus basi triangulato ampliatus et in vaginam latam productus. Vagina crasse coriacea trapezialis, 7-8 cm longa circa 6.5 cm lata argute paralleli-multinervata abaxiale dense longeque sericeo-barbata pilis tenuissimis antrorsis 15-20 mm longis, adaxiale sursum dense villoso-barbata tertio inferiori glabra apice utrinque congeste lanata.

Inflorescentiae thyrsoides axillares rosula foliorum duplo longiores. Axis circa 120 cm longus, moderate robustus erectus vel praecipue sursum paulo flexuosus; dimidia pars proximalis vegetativa circa 60 cm longa, simplex, exfoliata; dimidia pars superior fertilis ramosa circa 43 capitula ferens, tria in cyma terminali semper instructa, cetera in 6 paribus ramorum oppositorum ascendentium gracilium erectorum vel flexilium disposita. Internodia longitudine sursum decrescentia (v.g.:30, 13, 8, 4, 3 cm, terminale (pedicellum) 2.5 cm). Rami proximales inferiores saepe thyrso 7-capitulifero (30-36 cm longi) instructi, alteri thryso 5 capitulis (17-21 cm), ceteri cyma simplice (10-6 cm), distales monocephali (3-2 cm); omnes (inflorescentiae partiales) internodia paulo excedentes, ad summam habitu laxe graciliter pyramidali. Pedicelli vel pseudo-pedicelli 1-3 cm. erecti vel flexuosi. Bracteae subtendentes oppositae inferiores foliaceae 16-20 cm longae 1 cm latae oblanceolato-lineares acutae basi amplectentes breviter connatae, indumento lanato denso albo cinereo instructae. Ceterae pares bractearum minores sursum valde decrescentes 9-1 cm longae 1-0.5 cm latae,

triangulari-lineares quam rami valde breviores, supremae aequilongae exceptae, omnes dense adpresseque lutescente vel aureo-lanatae et vellereo-barbatae, distales aureae vel lutescentes. Axis dense adpresseque albo vel cinereo-lanatus plus minsve barbatus, rami crassiore molliterque intricato-lanati sursum sicut involucra indumento aureo tecti.

Capitula radiata erecta vel cernua 85-126 flores ferentia, ligulis amotis 20-25 mm diam, circulo ligularum 24-30 mm, disco 10-13 mm diametro. Involucrum cupulatum dense aureo-lanatum. Phyllaria sterilia crassiuscule herbacea 7-10, exteriora plerumque quinque 17-15 x 7-5 mm, oblonga apice paulo attenuata subite acutata vel subacuta, extus crasse intricato-lanata, intus glabra, viridula apice lanuginoso excepto, interiora 15-13 x 6-4 mm, etiam oblonga acutataque, extus lanata. Phyllaria fertilia exteriora herbacea 12-10 x 4-3.5 mm, oblonga acuta herbacea basi incrassata dorso villoso-lanata, cetera 8-7 x 2.5 mm scariosa amplectentia, 5 nervata pilosa costa villosula extremo dorsale lanuginoso-barbata.

Receptaculum convexum sublabrum 7-8 mm diametro. Paleae scariosae ovales apice triangulato, 7-7.5 x 2-3 mm, pluri nervata costa dorso eminenti basi incrassata ceteris nervis minus conspicuis dorso ad apicem barbulatae pilis flexuosis acutis erectis 0.25-0.4 mm.

Flores radii feminei 29-38 in capitulo, 2-3 seriati. Corolla lutea 12-13 mm longa, tubo 0.7-0.8 mm dense pilosulo pilis 0.2-0.3(-0.5) mm antrorsis vel patulis, basi crassioribus apice angustiori obtuso, subobtuso vel superioribus acutis plus glandulis minutis intersparsis; lamina lineari vel lineari-elliptica 2-2.4 mm lata apice obtuso breviter 2-3-dentata, 4-7 nervis 2 magis robustis notatis, abaxiale sparsis minutis glandulis circa basim parce pilosula, adaxiale glabra minute mamillato-velutina, stylus 5-6.5 mm longus ramis lance-linearibus crassiusculis 2 mm longis. Achaenia exteriora 2-2.3 x 1.5 mm ovata apice truncato-emarginata triangulata dorso plano-convexo, interiora 2.5 x 0.8-1 mm oblonga quadrangulata vel sub-quadrangulata.

Flores disci pseudohermaphroditi 56-88 in capitulo. Corolla lutea 7 mm longa, tubulo circa 2 mm longo sursum copiose piloso pilis antrorsis acutis supremis ad 0.7 mm longis et raris glandulis globosis subsessilibus intersparsis, limbo tubuloso basi tantum paulo pilosulo, lobis triangularibus 1-1.2 mm longis marginibus incrassatis extus glandulis globosis sparsis et parcis pilis flexuosis acutis 0.2-0.3 mm longis munitis; antherae 2.7-2.8 mm longae appendice apicali oblongo-subtriangulata 0.6-0.7 mm longa; stylus 9 mm extremo longe papilloso breviter incisus. Nectarium tubulosum 1 mm altum inaequaliter dentatum. Rudimentum ovarii brevi, 0.2 mm. alto.

Typus: Colombia, Cundinamarca: Cabrera, subiendo al Alto de Sumapaz, planada paramuna de Hoyerías, 3200 m alt.

caulirrosuletum con tallo muy corto, grandes inflorescencias con lanilla dorada, 23 Febr 1970, Lorenzo Uribe Uribe 6400. Holotypus US; isotypi COL.

ESPELETIA TAPIROPHILA Cuatr. sp. nov.

Caulirosula lata visu viridi-cinerea vel viridi-alba, vulgo 1-2 m interdum usque ad 5 m alta, caule simplici recto cum foliis marcescentibus vel vaginis foliorum valde adpressis spisse obtecto.

Folia coriacea firma utrinque congeste lanata sessilia 53-55 cm in toto longa. Lamina oblanceolato-linearis apicem versus angustata, acuta, deorsum gradatim attenuata, 45-48 cm longa circa 4.5 cm lata (9:1-10:1), supra basim 1.2-1.5 cm lata, margine revoluta integra tantum dentibus callosis minusculis remotis adaxiale cum indumento occultis, supra viridi-cinerea vel viridi-grisea pilis longis (5-10 mm) inferne spiraliter contortis superne rectis antrorsis densissimis adpressisque superficiem fere laevem formantibus tantum costa plana conspicua; subtus costa elevata carinato-costulata striataque rigida deorsum robusta dense adpresseque albido lanata, nervis secundariis prominentibus 7-9 inter se distantibus angulo 45-55° ascendentibus circa marginem furcatis anastomosantibus, nerviis tertiis subprominentibus cum minoribus similibus in reticulum elevatum densum anastomosatis. Nervi secundarii reticuloque densis pilis longis patulis pluricontortis intricatissimis indumento albo vel cinero-lanato instructis, alveolis profundis pilis albis minutis copiosis vel densis munitis. Vagina coriacea oblongo-trapezialis 6.5-7 x 5 cm, adaxiale apicem excepta glabra abaxiale denssissime adpresse longeque barbata pilis tenuibus antrosis ad 2 mm longis. Folia valde juvenilia et gemma terminalis nitentis dense crasse adpresseque albo-sericea.

Inflorescentiae thyrsoides axillares rosula foliorum duplo vel sesquilongiores. Axis 68-88 cm longus robustus erectus striatus, 2/3 vel dimidia parte proximali vegetativa 48-66 cm longa duobus paribus foliorum sterilium instructa intermodiis proximalibus 22-27 cm longis foliis lineari-lanceolatis acutis supra basim leviter angustatis, inferioribus 4 cm supra basim axi adnatis, 18-22 cm longis x 2-2.3 cm latis, vagina circa 5 cm longa per parem inferne tubuloso-connataintus glabra extus longe piloso barbata et minute diluteque glandulosa, altera folia paulo breviora tubulo vaginae minori. Dimidia vel tertia pars distalis fertilis ramosa bracteataque, 13-16 capitula ferens, tria in cyma terminali semper instructa, cetera in 3-4 paribus ramorum oppositorum patulo-ascendentium disposita; internodia longitudine sursum decrescentia (sequentia, v.g. 15, 9, 5 et 3.5 cm) terminale (pedicellus centralis) 3-4 cm. Rami proximales interiores cyma 3-capitulifera instructi 11-13 cm in toto longi, alteri 3-2 capituliferi 8-11 cm longi, distales monocephali 4-6 cm longi, omnes internodia paulo excedentes vel infimi conspicue breviores. Pedicelli vel pseudopedicelli sicut

rami striati robustiusculi erecti 2.5-3.5 cm longi. Bracteae subtendentes oppositae, lamina elongate ovato-triangulari acuta supra basim dilatata basi contracta et in vaginam amplectentem breviter per parem connatam productae, inferiores 9-10 x 2.5 cm sursum gradatim minores suprema circa 2 x 0.7 mm, notate nervatae, margine revoluta dentibus callosis remotis cum indumento adaxiale ocultis inferiores in textura folia vegetativa similares, ceterae virides abaxiale deorsum laxe longeque villoso-barbatae pilis rectis inferne crassiusculis ascendentibus 5-10 mm longis, sursum plus minusve lanuginosae, utrinque copiose minuteque glanduliferae. Axis dense albo-lanatus pilis tenuibus crispis densis tectus insuper pilis longioribus (usque ad 20 mm) ascendentibus barbulis elongatis gossypinis instructis, basi dense albo-villoso-barbatus pilis tenuibus 10-20 mm longis parallelis vel intricatis. Rami ramuli pedicellique dense crasse molleque albo vel flavo-lanati.

Capitula radiata cernua vel nutatia 166-212 flores ferentia, ligulis amotis 20-25 mm (in sicco), circulo ligularum 32-35 mm, disco 15-18 mm diametientia. Involucrum cupulatum viridulum moderate villoso-sublanuginosum. Phyllaria sterilia 9-10 herbacea 18-10 x 12-4 mm, ovato-triangularia vel ovato-oblonga acutata exteriora acuminata abaxiale copiose vel densiuscule villosa et glandulifera pilis antrorsis inferne 5 mm superne 2 mm longis acutis sursum plusminusve flexuosis intricato-barbatis, glandulis columnaribus 0.02-0.05 mm longis patulis, adaxiale precipue dimitia parte et sursum copione minuteque glandulifera, acumine etiam glandulifera et villoso lanuginosa. Phyllaria fertilia exteriora 12-8 x 5-2.5 mm oblonga acute attenuata abaxiale villosa et glandulifera adaxiale sursum etiam copiose breviterque glandulifera. Receptaculum circa 8 mm diam, plano-convexum parcis minutis pilis acutis 0.5 mm. Paleae membranaceae 7 x 3 mm ovales subacutae vel subobtusae, valde amplectentes costa subcarinata marginibus latis hyalinis, nervis 5-6 lateralibus plusminusve notatis, abaxiale costa antrorso pilosula subapice densiuscule barbulatae pilis rigidulis flexuosis 0.3-0.8 mm et glandulis breviter pediculatis copiose intersparsis.

Flores radii feminei 60-74 in capitulo, 3-seriati. Corolla lutea interdum rosea (9-) 11-14 mm longa tubo 1-1.2 mm longo sursùm densiuscule patulo piloso et glandulis pilis crassiusculis obtusis 0.2-0.7 mm, parcis acutis, et glandulis breviter pediculatis intersparis; lamina linearis 9 mm lata obtuse 2-3-dentata, 5-8-nervata, abaxiale glandulis minutis subsessilibus sparsis. Stylus 5 mm longus ramis late linearibus 2 mm. Achaenia exteriora 2-2.5 x 1.3-1.5 mm obovata triangularia apice truncata basi attenuata acuta, dorso convexo, interiora 2.8-3 x 1 mm, oblonga quadrangulata.

Flores disci pseudohermaphroditi 106-138 in capitulo. Corolla lutea 7-8 mm longa, tubulo 2-3 mm sursum sparse pilosa pilis 0.1-0.3 mm longis et glandulis pediculato-columnaribus

sparsis, limbo tubuloso-infundibuliformi inferne sparsis glandulis et basi copiose breviterque pilosulo, pilis crassiusculis obtusis 0.1-0.4 mm et sparse glanduloso, lobis triangularibus 1.2-1.3 mm altis margine incrassatis papillosisque abaxiale copiosis glandulis subglobosis subsessilibus ornatis, sed haud pilis. Stylus circa 8 mm. Nectarium tubulosum 0.7 mm longum, apice 5-dentatum dentibus incrassatis.

Typus: Colombia, Meta: Hoya del Rio Nevado, Puerta de Las Dantas; frailejón característico en el límite entre bosque y páramo, crece frecuente en lugares protegidos, 3400 m alt. caulirrósula 2 m, también unos de 5 m, flores amarillas a veces algunas inflorescencias con lígulas rosadas, 25 Jan 1973, Antoine M. Cleef 8301; holotypus US; isotypi COL, U.

ESPELETIA GRANDIFLORA H. & B. var BOYACANA Cuatr. var. nov.

Caulirosula visu albo-cinerea caule usque 1.3 m alto. Folia anguste elliptico-lanceolata basim contracta pseudo-petiolo bene signato, utrique albo-lanata vel flavescente lanata. Lamina 19-32 x 4-8 cm, 4:1-6:1 (-7:1), nervis 6-10 mm inter se distantibus angulo 45-50° ascendentibus. Petiolus 2-3.5 cm longus 6-9 mm latus. Vagina 5.5-7.5 x 4.5-7 cm. Inflorescentiae robustae 40-83 cm longae quam folia duplo longiores vel ultra, parte vegetativa elongata 2-5 paribus foliorum sterilium late linearium sessilium amplectentium, parte fertili 7-21 capitula ferenti thyrsoide ramosa bracteataque 1-5 paribus ramorum 1-3 capituliferorum instructa; axis dense albo-lanatus et plus minusve barbatus, rami bracteae involucraque dense longeque luteolo-villoso-lanata et saepe insuper barbata. Capitula ligulis amotis, in sicco, 2.5-3.5 cm diam. Phyllaria sterilia 22-20 x 17-15 mm ovata vel ovalia obtusa vel subobtusa, fertilia exteriora 18-7 x 11-5 mm oblonga obtusa vel subobtusa dense lanata interiora acutata. Flores 322-342 in capitulo, radii 100-106, disci 220-236. Corolla radii 12-15 mm longa tubo 3-4 mm densiuscule piloso, pilis crassiusculis obtusis basi incrassatis ad 0.5 mm et glandulis intersparsis, lamina lineari abaxiale sparsis glandulis subsessilibus. Achaenia exteriora 2-2.2 x 1.3 mm obovata triangulata basi subacuta, interiora 2.2-2.4 x 0.8-1 mm quadrangulata laterale compressa. Corollae disci tubo et basi limbi copiose pilosae et sparse glandulosae, lobis extus glandulis sparsis et saepe parcis pilis.

Typus: Colombia, Boyacá: NW-N de Duitama, Páramo de La Rusia, Serrania Negra ver S, 3900 m alt, páramo húmedo con dominancia de chusque, caulirrósula hasta 1.3 m, flores amarillas, "frailejón", 10 Dec. 1972 Antoine M. Cleef 6955; holotypus, US; isotypi U, COL. Other collections: Same locality and collector n° 6955-A, paratypus, US; isoparatypi COL, U. Boyacá: páramos NW de Belén, 2.5 km SE de Laguna Grande, Hoya El Púlpito, cerca Llano de Paja 3750 m, páramo

relativamente seco, pedregoso, caulirrósula 0.5,hojas oscuro-grisáceas, lígulas amarillas, "frailejón", 6 May 1973, A. M. Cleef 9785 (COL, U, US). Id. NW de Belén, Quebrada Minas, Hoya de Cuchilla Larga, Alto de Las Cruces, 3900 m, páramo húmedo, asociado con chusque, caulirrósula 75 cm, hojas grisáceas, lígulas amarillas, "frailejón:, 4 May 1973, A. M. Cleef 9729 (COL, U, US).

ESPELETIA GRANDIFLORA H. & B. var CAYETANA Cuatr. var. nov.

Caulirosula visu albo-cinerea caule usque 2 m alto. Folia late elliptico-lanceolata acutissima circa basim subite attenuata in pseudopetiolum bene contracta, utrinque albo-lanata. Lamina 30-35 x 9.5-10.5 cm (3:1-3.6:1), nervis 8-13 mm inter se distantibus angulo 45-50° ascendentibus. Petiolus 3.5-4.5 cm longus usque ad 7-8 mm latus. Vagina 7.5-8 x 5-6.5 cm. Inflorescentiae robustae 1/3 folia excedentes, 54-57 cm longae, 2-3 paribus foliis sterilibus, inferioribus ad basim rosularibus similibus petiolatis lamina 27-20 x 6-3.5 cm, alteris late linearibus 15-14 x 2.5-1 cm, internodio inferiori 32-33 cm altero 9-12 cm; parte fertili densiuscule 7-10 capitulifera, cyma terminali 3 capitulis et 2 paribus ramulorum instructa; rami omnes monocephali vel inferiores 2-3-cephali; axis dense albo-lanatus insuper albo-barbatus, rami bracteae involucraque dense longeque lutescente villoso-lanata et barbata. Capitula ligulis amotis in sicco 25-35 mm diam. Phyllaria sterilia exteriora (30-) 26-18 x (20-) 14-11 mm, ovato-acuminata vel ovato-attenuata dense villoso-lanata et barbata, fertilia 18-11 x 11-6 mm ovato-oblonga acuminata vel saepius oblonga acutaque, villoso-lanata et sparse glandulosa praecipue sursum. Flores 168-315 in capitulo, radii 60-87, disci 108-228. Corollae radii 20-23 mm longae tubo 3-4 mm brevissimis sparsis pilis crassis obtusis 0.01-0.05 mm, et glandulis minutis 0.01-0.025 mm. Corollae disci 9 mm subglabrae, tubo 4 mm sursum parcis vel parcissimis pilis papilliformibus crassis obtusis 0.005-0.02 mm et raris glandulis. Lobis haud pilis vel glandulis conspicuis. Achaenia exteriora 3-3.2 x 2.5-2.2 mm obovato-triangularia basi attenuata obtusa dorso plano-convexo, interiora 3.4-3.6 x 1-1.2 mm oblonga quadrangulata.

Typus: Colombia, Cundinarnarca: Páramo entre Cogua y San Cayetano, a 2 km S de Laguna Seca, vert. E del filo del Santario, valle abrigado 3650 m, matorral de subpáramo con Epatorium tinifolium, Rapanea, Berberis y Hypericum, caulirosula 2 m, hojas grisáceas, lígulas amarillas, 17 Oct 1972, Antoine M. Cleef 6508; holotypus US; isotypi COL, U.

ESPELETIA GRANDIFLORA H. & B. var. MIRADORENSIS Cuatr. nov. var.

Caulirosula visu albo-cinerea vel viridi-cinerea caule circa 1.5 m alto. Folia elliptico-lanceolata acuta deorsum attenuata cuneata in petiolum longum contracta utrinque cinereo-lanata. Lamina adulta robusta rigida 35-38 x 8-8.5 cm, (4.2:1-4.6:1), nervis 6-10 mm inter se distantibus angulo 50-55° ascendentibus. Petiolus 8-11 cm longus valde robustus rigidusque 10-12 mm crassus basi triangulare ampliatus. Vagina 9-10 x 7 cm coriacea adaxiale glabra, ad apicem utrinque dense crasseque lanato barbata. Inflorescentiae ad circa 90 cm longa rosulam duplo excedentes, axe robustissimo dense albo crispo-lanato, ultra dimidia parte inferiori vegetativa 2 paribus foliorum sterilium ferenti; folia proximalia circa basim nascentia circa 32 x 4.5 cm, longe petiolata vaginataque, vaginis basi in tubum (3 cm altum) connatis, altera paulo breviora sed sessilia, omnia cinerea dense floccoso-crispo-lanata; pars fertilis thyrsoide ramosa bracteataque 19 capitula in 5 paribus ramorum instructa ferens, ramis inferioribus 3-cephalis sursum monocephalis, omnis lutescenti-lanata. Capitula ligulis amotis in sicco 30-35 mm diam. Phyllaria sterilia 26-20 x 18-8 mm, ovato-oblonga et oblonga acutata vel subobtusa crasse lanata, fertilia 20-16 x 8-6 mm, oblonga subite acutata extus villosa sursum lanuginosa. Flores 171 in capitulo, radii 50, disci 121. Corollae radii 16-17 mm longae tubo 4.5-5.5 mm subglabro sparsissimis pilis papilliformibus (0.05-0.1 mm) et glandulis minutis, lamina lineari 2-3 mm lata extus glandulis minutissimis (0.02 mm) sparsis. Achaenia triangulata apice emarginato-cordata 3.5 x 2.7-2.3 mm, intima quadrangulata 3.8 x 1.6-1.8 mm. Corollae disci 11 mm longa subglabra sparsis glandulis et raris pilis minimis papilliformibus.

Typus: Colombia, Cundinamarca: Páramo de Sumapaz, Alto de Lagunitas, El Mirador, 5 km S de San Juan, límite de un pantano con páramo seco, 3560 m alt. caulirrósula 1.5 m, hojas anchas, grisáceas verdosas, lígulas amarillas, 28 Jan 1973, Antoine M. Cleef 8421; holotypus, US: isotypi, COL, U.

ESPELETIA GRANDIFLORA H. & B. var. SUBNIVALIS Cuatr. nov. var.

Caulirosula visu albo-cinerea vel viridi-cinerea caule ad 1 m alto. Folia anguste elliptica sublanceolata vel oblanceolata apice acuta deorsum attenuata et in longum petiolum contracta, utrinque albo vel cinereo-lanata. Lamina 32-35 x 5.2-6.3 cm (6:1) nervis 7-10 mm inter se distantibus angulo circa 50° ascendentibus. Petiolus 8-14 cm longus robustus rigidus 7-10 mm crassus basi triangulare ampliatus. Vagina 6.5-8 x 4.5-6.5 cm. Inflorescentiae robustae ad 80 cm longa tertio vel duplo folia excedentes, dimidia parte inferiori vegetativa vel paulo breviori, 1-2 paribus foliorum sterilium brevipetiolatorum vel subsessilium vaginis longe

connatis ferenti; pars fertilis usque 27 capitula ferens, thyrsoide ramosa bracteataque ad 5 paribus ramorum 5-1 capituliferorum instructa; axis dense albo-lanatus et plus minusve floccoso-barbulatus, rami bracteae involucraque dense crasse lutescente crispo-lanata. Capitula ligulis amotis in sicco circa 2.5 cm diam. Phyllaria sterilia 18-15 (-12) x 10-5 (-3) ovato-oblonga subobtusa dense crispo-lanata interiora acutata, fertilia oblongo-ovata acutata 12-8 x 5-2.5 mm extus lanata et sparse glandulosa. Flores 144-275 in capitulo, radii 41-85, disci 103-190. Corolla radii 12-15 mm longa tubo 0.8-1.5 mm, densis pilis brevibus crassis subconicis obtusis 0.1-0.2 mm et glandulis sparsis obsito, lamina oblonga circa 3 mm lata extus glandulis subsessilibus vel breviter pediculatis sparsis. Achaenia triangulata 2.6 x 1.3 mm, interiora quadrangulata 2.7 x 1 mm. Corollae disci 7-8 mm, apice tubi et basi limbi parcis pilis brevissimis (0.05-0.2 mm) crassis obtusis et parcis glandulis breviter pediculatis, lobis abaxiale sparsis glandulis.

Typus: Colombia, Meta: Páramo de Sumapaz, Cerro Nevado del Sumapaz, páramo propiamente dicho, seco, con Calamagrostis effusa, vertiente SW hacia el Alto del Buque, 3650 m alt, caulirrósula 1 m, hojas grisáceas verdosas, lígulas amarillas, "frailejón", 29 Jan 1972, Antoine M. Cleef 1372; holotypus, US; isotypus, COL, U. Paratypus: id. Cerro Nevado del Sumapaz, límite con el superpáramo, vertiente W-NW, 4060 m alt, asociado con Chusquea, en vallecito abrigado, caulirrósula 0.50-1 m, hojas grisáceo-verdosas, lígulas amarillas, 18 Jan 1973, A.M. Cleef 8054 (COL, U, US).

ESPELETIA GRANDIFLORA var. ATTENUATA Cuatr. nov. var.

Caulirosula usque ad 2 m alta. Folia attenuato-lanceolata, lanceolato-linearia quam var. grandiflora angustiora usque basim gradatim angustata pseudopetiolo brevi vel obsoleto. Lamina 21-38 x 22-4.5 (-4.7) cm, ratio 7:1-10:1 (-11:1) supra basim 7-12 mm lata, pseudopetiolo obscuro 1-3(-4) cm, vagina (5-)6-7.5 x 4-5.6 cm, nervis secundariis 4-7(-9) mm inter se distantibus, angulo 40-50°(-60°) ascendentibus. Inflorescentiae thyrsoides quam rosula sequi-vel usque duplo longae, 50-76(-105) cm altae, 7-23 capitula ferentes, 1-4 paribus foliorum sterilium, cyma terminali 3-1 cephali et 3-5 paribus ramorum fertilium. Rami 1-2 inferiores 3-2-cephali, alteri monocephali, interdum omnes monocephali. Capitula in sicco ligulis amotis, (20-)25-35 mm diam. Phyllaria 5-7 exteriora 21-15 x 11-5 mm, aliquando 10-12 adittionalia 2-seriata 15-10 x 5-3 mm, ovato-triangulata vel ovato-oblonga; phyllaria fertilia exteriora 14-10 x 6-2.5 mm oblongo-attenuata acuta extus dense lanata; paleae 8.5 x 3 mm anguste ovales acutae extremo barbato et minutis glandulis. Receptaculum 10-16 mm diam plano-convexo glabro. Flores (133-)157-296 in capitulo,

radii (45-)63-106, disci (88-)94-200. Corollae radii (10-)13-17 mm longae, tubo 1-2.5 mm longo dense piloso pilis crassiusculis obtusis interdum acutis patule curvato-ascendentibus et parcis glandulis obovoideo-oblongis minute pediculatis; lamina linearis 1.8-2.6 mm lata abaxiale glandulis oblongo-obovoideis, clavatis 0.025 mm; corollae disci 8-8.5 mm longa tubulo et basi limbi copiosis pilis subacutis vel obtusis vel acutis deorsum incrassatis 0.1-0.4 mm et parcis glandulis, lobis copiosis glandulis obovoideis, subclavatis 0.025 mm. Achaenia oblonga 2.4 x 1.8 mm triangulata basi obtusiuscula, intima 3 x 1 mm, quadrangulata.

Typus: Colombia, Cundinamarca: Macizo Bogotá-Sumapaz: Páramo de Chisacá, around Laguna de Chisacá, 3700 m alt, caulirosula with short stem, leaves grayish green, heads yellowish, ligules yellow, 29 Dec. 1959, Cuatrecasas & Jaramillo 25748; holotypus US, isotypus COL. Other collections: Id. around Laguna Negra, 3700-3720 m, caulirosula 1 m, leaves white, inflorescence yellowish, involucres yellowish, ligules and disc corollas yellow, anthers brownish, 11 Sep. 1961, Cuatrecasas & Jaramillo 25908 (paratyes, US, COL). Id. Alto de Caycedo páramo 3800-3820 m, stem 0.5 m, chromosome number n=19, Jan 9, 1969, Cuatrecasas 27094 (US, COL).

ESPELETIA KILLIPII var. CHISACANA Cuatr. var. nov.

Capitula ligulis amotis 3.5-4 cm diametro. Circulus ligularum 40-55 mm, discus 22-25 mm diametro. Phyllaria sterilia externa latiora, ovata vel oblongo-ovata, obtusa vel subacuta, 33-24 x (23-)19-13 mm, 5-8 medialia 24-20 x 14-6 mm oblongo-ovalia vel oblongo-elliptica obtusa vel subacuta, et 0-15 interiora 20-11 x 10-4 mm tenuiora oblonga acutata vel subacutata. Corollae radii (20-)24-27 mm longa lamina 2.5-3.5 mm lata, tubulo 1.5-2(-3.5) mm longo. Corollae disci 9-12.5 mm longa. Inflorescentia praecipue 5, interdum 7 vel 3 capitulis. Lamina foliorum 35-45 x 3.5-6 cm, basi usque ad 1.6-1 cm lata angustata oblonga saepe magis acuminata nervis lateralibus 5-8(-10) mm distantibus angulo 50-60°(-70°) ascendentibus.

Typus: Colombia, Cundinamarca: Páramo de Chisacá, NW end of the high plateau of Macizo de Bogotá-Sumapaz, 3680-3700 m alt, trunk 50 cm high, rosette very broad, inflorescences pale yellowish, rays and disc corollas yellow, 16 Sept 1961 Cuatrecasas & Jaramillo 25986; holotypus, US; isotypi: COL, US. Other collections: Id. Páramo de Chisacá, open hill at the left side of the road, 3680-3700 m, trunk 60 cm high, 8-9 inflorescences pale yellow, rays and florets yellow, 16 Sep 1961, Cuatrecasas & Jaramillo 25988 (paratype US, COL, P); id. near the lake 3650-3700 m, caulirosula, stem up to 1.5 m high, covered with marcescent leaves, rosette and inflorescences grayish white, heads yellowish whitish, 29 Dec 1959, Cuatrecasas & Jaramillo 25744 (paratypes, US, COL, P); Id. loc. 1-2 m tall, chromosome number n=19, abundant, 18 June 1965, King, Guevara & Forero 5659, 5658 (F, NY, US).

TAGETES ERNSTII (TAGETEAE: ASTERACEAE), A NEW SPECIES FROM OAXACA, MEXICO

Harold Robinson and Dan H. Nicolson
Department of Botany
Smithsonian Institution, Washington, D.C., 20560.

The most recent major work on the genus *Tagetes* is an unpublished thesis (Neher, 1965, University of Indiana) which recognized 40 species. Study of the Neher keys and descriptions and review of specimens in the U. S. National Herbarium (US) convinces us that a collection, *W. R. Ernst 2219* (Fig. 1) from Oaxaca, represents a new species.

The unique feature of the new species is the heteromorphic pappus with partial or complete fusion of squamae. The pappus may be interrupted by one or two subulate squamae or by a single division but it often is completely undivided, forming a continuous sheath around the base of the corolla (Fig. 2). This completely fused and truncated pappus is characteristic of the inner disk flowers. Outer disk flowers usually have one subulate squama, sometimes two. Ray flowers usually have two subulate squamae.

The only two species of *Tagetes* reported (Neher, 1965) as lacking subulate squamae in either the disk or ray flowers are *T. linifolia* Seaton and *T. hartwegii* Greenman, both of Mexico. In *T. linifolia* the ray flowers lack subulate squamae and the disk flowers have them, just the opposite of the new species. In *T. hartwegii* the disk flowers have the unique character of typically being completely epappiferous. The new species also differs from *T. linifolia* and *T. hartwegii* by having upper leaves more often alternate, in having branches bearing several heads, and in having strikingly smaller ray corollas (6-8 mm long vs. 10-16 mm). Both *T. linifolia* and *T. hartwegii* are known only from their type localities, *T. linifolia* from Esperanza on Mt. Orizaba, Puebla, and *T. hartwegii* from the Bolaños Valley in northern Jalisco.

If one emphasizes the size of ligules, as Neher (1965) did by making it the opening character in his key to the subgenus *Tagetes*, the new species would seem most similar to *T. jalis-censis* Greenman which is distributed from northern Mexico to Costa Rica. This species differs not only in having the pappus of all flowers with subulate squamae, but in having a more fusiform involucre, fewer disk flowers (only 10-12 vs. 25), larger achenes (8-10 mm long vs. 5-7 mm), and shorter peduncles (2-4 cm long vs. 5.0-7.5 cm).

We name the new species in honor of the collector, Wallace

Roy Ernst, our former colleague (cf. Thomas & Shetler, 1973). This new species was found in the process of identifying, labelling and distributing the materials from Dr. Ernst's collecting trip to Oaxaca in January-February, 1966.

Tagetes ernstii H. Robinson & D. H. Nicolson, species nova.

Plantae suffrutescentes usque ad 0.7 m altae, perennes (?) plerumque glabrae. Caules teretes vel leniter sexangulares. Caules majores et rhachides foliorum pilis minutis perbrevis uniseriatis pauciseptatis eglandulosis sparse obsiti. Folia inferiora opposita superiora alternata profunde pinnatifida plerumque 3-5 cm longa, pinnis plerumque oppositis utrinque 3-5 anguste ellipticis 7-15 mm longis et 1.5-3.0 mm latis argute serratis apice breviter acuminatis margine inter dentes prominente uniglandulopunctatis, punctis minoribus interioribus in pinnis majoribus. Inflorescentia corymbosa, pedunculis elongatis 5.0-7.5 cm longis inferne pauce bracteatis superne glabris sub involucris sensim distincte incrassatis, bracteis subbasalaribus 0.5-1.2 cm longis pectinatis vel pinnatis aristiferis. Involucra late fusiformia vel cylindrica 1.3-1.5 cm longa ca. 3.5 mm lata 5-lobata, lobis ca. 1.5 mm longis latioribus quam longioribus apice breviter acutis, punctis glandulosis in valvis omnino biseriatis inferne elongatis ad 1 mm longis. Flores ca. 30, radiis 5; corollae radiorum 6-8 mm longae aurantiacae, tubis 3-4 mm longis, limbis subquadratis leniter bilobatis 3-4 mm longis et latis. Flores disci ca. 25; corollae 6.5-8.0 mm longae superne rufescentes extus glabrae, lobis linearibus ad 2.5 mm longis margine et intus setiferis; filamenta in parte superiore 0.6-0.7 mm longis; thecae ca. 1.8 mm longae; appendices antherarum ca. 0.4 mm longae et 0.15 mm latae. Achaenia subfusiformia 5-7 mm longa superne 0.5-0.7 mm lata plerumque in costis minute setifera; carpopodia minuta; squamae pappi 1-3 in floribus radiis 1-2 subulatae 6-7 mm longae, in floribus disci plerumque 0-1 subulatae, squamis brevioribus 2.5-3.5 mm longis omnino 1 saepe integris indivisis apice vix lobatis minute scabrellis extus sparse scabrellis. Grana pollinis 25-27 μ in diametro.

MEXICO: Oaxaca: near San Lorenzo, northeast of Mitla, pine-oak-manzanita woodland, rays orange, disc brown, 19 January 1966, W. R. Ernst 2219 (Holotype: US-2725920; Isotypes: to be distributed).

Literature Cited

Neher, R. T. 1965. Monograph of the genus *Tagetes* (Compositae). 306pp. Ph.D. Thesis, Indiana University, Bloomington.

Thomas, J. H. and Shetler, S. G. 1973. Wallace Roy Ernst, 1928-1971. *Madroño* 22: 207-213.

Figure 1. Tagetes ernstii Robinson & Nicolson, Holotype, United States National Herbarium. Photo by Victor E. Krantz, Staff Photographer, National Museum of Natural History.

Figure 2. Heads and achenes from the holotype of Tagetes ernstii, the achenes with pappus squamae united, fused and truncate or with 1 or 2 subulate squamae.

STUDIES IN THE SENECIONEAE (ASTERACEAE). VII.

ADDITIONS TO THE GENUS *ROLDANA*

Harold Robinson
Smithsonian Institution, Washington, D.C. 20560.

In the recent resurrection of the genus *Roldana* La Llave & Lagasca (Robinson & Brettell, 1974) 48 species were recognized with 7 described as new. One new species and two new combinations are offered here with corrections on other recent work in the genus.

A recent paper by Williams (1975) includes references to some species of the genus *Roldana*. One of these, *R. greenmanii* Robinson & Brettell is simply and rather needlessly transferred to *Senecio* but the other cases are more complicated.

Senecio orogenes is a new species proposed by Williams related to *R. schaffneri* (Sch.Bip.) R.& B. The Williams species was described from Nicaragua but seems to represent an extreme form which occurs throughout the range of *R. schaffneri*. Specimens seen include, *Molina 24049* from Honduras, *Matuda 734* from Chiapas, and *Matuda 1381* from Veracruz. A number of intermediate forms have also been seen from southern Mexico and a separate species status does not seem to be warranted.

Roldana petasioides (Greenm.) H.Robinson, comb. nov. *Senecio petasioides* Greenm. in J.D.Smith, Bot. Gaz. 37: 419. 1904. I accept Williams' suggestion that the name *Roldana petasites* (Sim)R.&B.is misapplied to the this Central American species. I would go further and suggest *R. petasites* might be the proper name for the Mexican species known as *R. sartorii* (Hemsl.) R.& B. However, the reasoning of Williams cannot be followed regarding number of flowers or leaf pubescence in either species. His conclusions place great reliance on an unreliable illustration and they are inconsistent with either *R. chiapensis* R.& B. which he synonymizes or with the type description of *R. petasioides* itself. The concept accepted here excludes *R. chiapensis* which completely lacks the tomentose leaf undersurface characteristic of *R. petasioides*.

Roldana quezaltica (Williams) H.Robinson, comb. nov. *Senecio quezalticus* L.Williams, Phytologia 31: 446. 1975. The species is related to *R. aschenborniana* (Schauer) R.& B. but Williams gives none of his reasons for the distinction except perhaps geography. The species is accepted here somewhat hesitantly on the basis of two specimens (*J.D.Smith 2362*; *Skutch 319*)

both from Guatemala, having leaves which are broadest distinctly below the middle and which have rather coarse sparse pubescence on the undersurface.

A specimen from Oaxaca, Mexico, distributed by the New York Botanical Garden as Senecio acutangulus (Berto.) Hemsl. vel. aff., differs from that Guatemalan species by the more acute phyllaries without discolored tips and by the mottled surface of the stems. The stems resemble those of R. hartwegii (Benth.) R.& B. of western Mexico but the corollas of the later have pubescent basal tubes. The Oaxaca material seems to represent an undescribed species in the group with subcymose inflorescences.

Roldana subcymosa H.Robinson, sp. nov. Plantae herbaceae usque ad 1.5 m altae pauce vel non ramosae breviter rhizomatosae; radices fibrosae. Caules sparse floccoso-tomentosi distincte striati nigro-maculati. Folia alternata longe petiolata, petiolis usque ad 7 cm longis, laminis oblongo-orbiculatis 6-15 cm longis 5-15 cm latis breviter dentatis 10-14 angulatis et minute denticulatis apice obtuse acutis base cordatis supra sparse breviter pilosis subtus minute floccose albo-tomentosis, nervis palmatis vel subpalmatis. Inflorescentiae terminales subcymoso-paniculatae, bracteis plerumque minutis, pedicellis ultimis 5-11 mm longis sparse puberulis, squamis subinvolucri 3-4 minutis angustatis. Capitula subcylindrica 11-12 mm alta 4-5 mm lata, squamae involucri 8 anguste oblongae 7-8 mm longae plerumque 1.5 mm latae extus glabrae margine et ad apicem late scariosae apice anguste rotundatae. Flores flavi; flores radii (1-)3, tubis angustis ca. 4 mm longis glabris, limbis anguste ellipticis ca. 6 mm longis ca. 2.5 mm latis; flores disci 7-8; corollae ca. 8 mm longae, tubis ca. 3.5 mm longis glabris, faucis anguste infundibularibus ca. 2 mm longis, lobis ca. 2.5 mm longis ca. 0.6 mm latis; thecae antherarum ca. 2 mm longae, appendicibus 0.4 mm longis. Achaenia cylindrica ca. 2 mm longa glabra; carpopodia subcylindrica, cellulis ca. 10-seriatis quadratis vel brevioribus; pappus 5-6 mm longus facile deciduus 2-3-seriatus, cellulis apicalibus setarum angustis argute acutis. Grana pollinis ca. 35 μ diam.

MEXICO: OAXACA: In a moist ravine in pine-oak-alder zone well up in the Sierra Madre del Sur, about 125 km south of Oaxaca, on the road to Puerto Angel. Elevation about 2400 m. Plants single-stemmed, to 1.5 m, from a very short, thickened, fibrous-rooted rhizome-caudex. Heads yellow (not orange or golden), with (1-)3 rays and 7-8 disk flowers. Growing with #10887, S. roldana DC. var. roldana, which however is larger (to 2.5 m) and coarser with bright orange-yellow, discoid heads that have 17-18 flowers. November 7, 1970. Cronquist and Fay 10888 (Holotype US).

Robinson, H. and Brettell, R. D. 1974. Studies in the Senecioneae (Asteraceae). V. Phytologia 27: 402-439.
Williams, L. O. 1975. Tropical American Plants, XVIII. Phytologia 31: 435-447.

NOTES ON NEW AND NOTEWORTHY PLANTS. LXXXIII

Harold N. Moldenke

LANTANA EITENORUM Moldenke, sp. nov.

Herba perenna, ramis erectis solitariis vel paucis ca. 1 m. altis tetragonis longitudinaliter sulcatis ubique albido-pilosulis, marginibus obtusis, internodiis elongatis; foliis decussato-oppositis breviter petiolatis; petiolis 5—8 mm. longis dense rigido-pilosis; laminis foliorum ellipticis vel elliptico-ovatis chartaceis 4.5—8 cm. longis 2.5—4.5 cm. latis ad apicem acuminato-acutis, marginibus serratis, ad basin cuneatis supra scabris et pustulato-pilosis subtus dense villosulo-pilosis; inflorescentiis axillaribus brevissimis capitato-spicatis.

Perennial herb from a woody rootstock; stems erect, solitary or few, to about 1 m. tall, obtusely tetragonal, conspicuously longitudinally sulcate, whitish-pilosulous throughout with weak, irregular, and somewhat twisted hairs; principal internodes mostly elongate, 7—15 or more cm. long; leaves decussate-opposite, chartaceous, dark in drying; petioles very short, mostly 5—8 mm. long, densely white-pilose with rigid antrorse sharp-pointed hairs; leaf-blades elliptic or elliptic-ovate, 4.5—8 cm. long, 2.5—4.5 cm. wide, acute or acuminate at the apex, regularly antrorsely serrate along the margins, cuneate into the petiole at the base, decidedly scabrous above with pustulate-based stiff but appressed whitish hairs which soon rub off, densely villosulous beneath with grayish-brown spreading hairs which are longer and wide-spreading along the primary and secondary venation, the lamina punctate; inflorescence axillary, shorter than the subtending leaves, mostly 1.5—3 cm. long in all, mostly two per node but occasionally also a much abbreviated branchlet from the same node and with a pair of diminutive leaf-like bracts and a pair of reduced inflorescence-heads at its apex; bractlets lanceolate, the lowermost about 1 cm. long, the upper smaller, all very long caudate-acuminate at the apex and densely appressed-pilose with stiff, antrorse, white, sharp-pointed hairs on the back; corolla hypocrateriform, about equaling the subtending bractlet, mostly lilac-colored (or some with the limb white), with or without a ring of golden-yellow around the throat entrance.

The type of this species was collected by Ezechial Paulo Heringer and George Eiten (no. 14185) along a roadside through a partially cleared cerradão in a region of rolling terrain with partially cleared cerradão, xeromorphic tree-woodland on uplands, and narrow gallery forests along brooks, 12 km. due west of Caldas Novas and 5.1 km. north of the entrance to the hotel "Pousada do Rio Quente", along the side road from the hotel to the main Morrinho-Caldas Novas highway several km. west of the foot of the west slope of the Serra de Caldas, Município de Caldas Novas, Goiás, Brazil, on December 23, 1974, and is deposited in the

United States National Herbarium at Washington. It is named in honor of George and Liene T. Eiten, who are doing such noteworthy botanical work in various parts of Brazil and whose collection labels give such valuable details on the geography, geology, topography, and ecology of the regions where each plant was collected.

LANTANA MICRANTHA f. EITENORUM Moldenke, f. nov.

Haec forma a forma typica speciei corollis scarlatinis vel aurantiaco-luteis recedit.

This form differs from the typical form of the species in having its corollas scarlet or orange-yellow.

The type of the form was collected by George and Liene T. Eiten (no. 5629) — in whose joint honor it is named — in an area once covered by gallery forest, now cleared and forming a brushy field with shrubs to 2 m. tall plus a thick growth of molasses-grass, at an altitude of 575—625 meters, at the Fazenda Campininha just north of Rio Moji-Guaçu, 3.7 km. north-northwest of Padua Sales and about 27 km. northwest of Moji-Mirim, in the "Campos das Sete Lagôas", Município de Moji-Guaçu, São Paulo, Brazil, on July 31, 1964, and is deposited in the United States National Herbarium at Washington. The collectors describe the plant as a shrub 1.5 m. tall.

LIPPIA BRADEANA Moldenke, sp. nov.

Frutex; ramis ramulisque gracilibus tetragonis longitudinaliter sulcatis ubique puberulis; nodis crassiusculis annulatis; foliis decussato-oppositis breviter petiolatis; petiolis gracillimis 2—7 mm. longis dense puberulis; laminis foliorum ellipticis 4—6 cm. longis 2.5—4 cm. latis ad apicem acutis ad basin plusminusve attenuato-acutis marginibus serrulatis supra scabridis subtus in reticulo venarum venularumque puberulis; inflorescentibus axillaribus numerosis; pedunculis filiformibus 2—5 per axilla 2—2.5 cm. longis dense puberulis; capitulis subglobosis 1—1.5 cm. longis latisque; bracteis foliaceis ovatis 7—10 mm. longis acutis ca. 5 mm. latis adpresso-pilosis longe ciliatis.

Shrub; branches and branchlets slender, tetragonal, rather deeply longitudinally sulcate, the angles rounded, rather densely puberulent throughout; nodes thickened, annulate; leaves decussate-opposite, short-petiolate; petioles very slender, 2—7 mm. long, densely puberulent; leaf-blades elliptic or slightly oval-elliptic, 4—6 cm. long, 2.5—4 cm. wide, abruptly acute at the apex, serrulate along the margins, somewhat attenuate-acute at the base, scabridous above, puberulent beneath on the entire vein and veinlet reticulation; inflorescence axillary, abundant; peduncles very slender or filiform, 2—5 (mostly 4) per node, mostly 2—2.5 (occasionally to 4.5) cm. long; heads subglobose, about 1—1.5 cm. long and wide, densely many-flowered, conspicuously bracteate; bracts membranous, ovate, conspicuous, imbricate, 7—10 mm. long, about 5 mm. wide at the base, acute at the apex, appressed-pilose on the back with antrorse hairs, the

margins long-ciliate; corolla hypocrateriform, its slender tube subequaling the subtending bract, the limb about 5 mm. wide.

The type of this species was collected by Apparicio Pereira Duarte (no. 7850) at Engenheiro Dolabela Granjas Reunidas, Minas Gerais, Brazil, on May 2, 1963, and is deposited in the Britton Herbarium at the New York Botanical Garden. It is named in honor of my late friend and colleague, Alexandre Curt Brade (1881-1967), distinguished student of the Brazilian flora.

LIPPIA BRADEANA var. VELUTINA Moldenke, var. nov.

Haec varietas a forma typica speciei ramulis densissime albido-pilosis vel -villosulis et foliis lanceolatis supra dense adpresso-pilosis subtus densissime albido-tomentosis recedit.

This variety differs from the typical form of the species in having its branchlets very densely white-pilose or white-villosulous and its leaf-blades narrow-lanceolate, gradually attenuate to the apex, densely appressed-pilose above with antrorse hairs and very densely white-tomentose beneath.

The type of the variety was collected (probably) by Johann Emanuel Pohl between 1817 and 1821 somewhere in either Goiás, Minas Gerais, or Rio de Janeiro, Brazil, and is deposited in the herbarium of the Botanische Staatssammlung at Munich.

PREMNA QUADRIFOLIA var. WARNECKEANA Moldenke, var. nov.

Haec varietas a forma typica speciei laminis foliorum subtus eglandulosis recedit.

This variety differs from the typical form of the species in having the lower leaf-surface without glands.

The type of the variety, bearing the cheironymous name, Premna warneckeana Gürke n. sp., was collected by Otto Warnecke (no. 290) — in whose honor it is named — at Lome, Togoland, in or before 1902 and is deposited in the herbarium of the Botanische Staatssammlung at Munich.

PREMNA RICHARDSII Moldenke, sp. nov.

Frutex, ramis gracilibus ubique puberulis et aureo-resinosis longitudinaliter striatis; foliis decussato-oppositis longepetiolatis; petiolis gracilibus 2.5—7 cm. longis ubique puberulis; laminis foliorum ovatis 8—12 cm. longis 4—8 cm. latis ad apicem acuminatis ad basin truncatis vel subtruncatis integerrimis supra glabris subtus secus venos primarias secundariasque plusminusve pilosulis; inflorescentibus terminalibus pyramidato-paniculatis ca. 15 cm. longis ad basin usque ad 8 cm. latis non corymbiformibus.

Large spreading shrub; branches very slender, densely puberulent throughout, longitudianlly striate, covered throughout with abundant often glistening-golden resinous glands; leaves decussate-opposite, long-petiolate; petioles very slender, 2.5—7 cm. long, densely puberulent throughout; leaf-blades ovate, thin-membranous, 8—12 cm. long, 4—8 cm. wide, rather long-acuminate or even subcaudate at the apex, entire, truncate or subtruncate

at the base, glabrous above, more or less pilosulous beneath along the larger parts of the primary and secondary veins, more abundantly so when young and then somewhat obscurely puberulent on the lamina; inflorescence apparently terminal, pyramidal-paniculate, not at all corymbiform, about 15 cm. long and to 8 cm. wide at the base, with 1 or 2 pairs of branches at the base, many-flowered; peduncles very slender, about 5 cm. long, densely puberulent and more or less glandular; rachis very slender, densely puberulent throughout, the sympodia numerous; pedicels subobsolete; calyx campanulate, pale-green, densely puberulent, about 1.5 mm. long and 2 mm. wide, its rim truncate or subtruncate; corolla small, hypocrateriform, white.

The type of this species was collected by M. Richards (no. 21049) — in whose honor it is named — among large rocks on the top of Kimiramatonge Mountain, at an altitude of 4000 feet, in the Ruaha National Park, Tanzania, on January 25, 1966, and is deposited in the Britton Herbarium at the New York Botanical Garden.

SYNGONANTHUS CAULESCENS f. LONGIPES Moldenke, f. nov.

Haec forma a forma typical speciei pedunculis usque ad 30 cm. longis differt.

This form differs from the typical form of the species in having its peduncles during anthesis and fruiting up to 30 cm. in length.

The type of the form was collected by H. S. Irwin, R. Souza, and R. Reis dos Santos (no. 8730) on a creek-bank in burned-over cerrado near Sobradinho, Distrito Federal, Brazil, at an altitude of 1100 meters, on September 27, 1965, and is deposited in the Britton Herbarium at the New York Botanical Garden. The collectors describe the plant as erect and to "25 cm." tall (but this is obviously inaccurate since some of the peducnles alone measure to 30 cm. in length).

PAEPALANTHUS FASCICULIFER var. CAPILLIFOLIUS Moldenke, var. nov.

Haec varietas a forma typica speciei recedit foliis capillaceo-filiformibus glabris vel subglabratis, pedunculis solitariis multistriatis, et vaginis glabris multistriatis.

This variety differs from the typical form of the species in having its leaves filiform or thread-like, 1 mm. or less in width throughout, glabrous or subglabrate, the peduncles solitary, many-ribbed, the sheaths glabrous and many-striate, etc.

The type of the variety was collected by Gert Hatschbach (no. 36839) on "campo corrego barrancos arenosos" at Chapada dos Veadeiros, Município Alto Paraiso, Goiás, Brazil, on May 25, 1975, and is deposited in my personal herbarium at Plainfield, New Jersey.

ADDITIONAL NOTES ON THE GENUS CORNUTIA. V

Harold N. Moldenke

Herbarium acronyms employed in this and in all of the other installments of these "Additional Notes" are explained in full in my "Fifth Summary", pp. 795—801 (1971) and its supplements.

CORNUTIA OBOVATA Urb., Symb. Ant. 1: 395. 1899.

Additional bibliography: Moldenke, Phytologia 14: 427. 1967; Moldenke, Fifth Summ. 1: 105 (1971) and 2: 876. 1971; Little, Woodbury, & Wadsworth, Trees P. R. & Virg. Isls. 2 [U. S. Dept. Agr. Agric. Handb. 449]: xii, 854, 862, 863, 997, 1001, 1014, & 1015, fig. 682. 1974.

Illustrations: Little, Woodbury, & Wadsworth, Trees P. R. & Virg. Isls. 2 [U. S. Dept. Agr. Agric. Handb. 449]: 863, fig. 682. 1974.

Gregory describes this as a tree, 30 feet tall, the trunk 8 inches in diameter at breast height, and the flowers "bluish", blooming profusely in July and with both immature and mature fruit in September. His no. 50 is said by him to be the "first record [of this species] for the forest service". Little and his associates (1974) record the additional vernacular name, "copá jigüerilla", and refer to the species as "This rare small tree known only from Puerto Rico.....Rare and local in moist limestone and Cordillera forests at 1,000—3,000 feet altitude in central mountains of Puerto Rico. Discovered by Sintenis in 1885 on Monte Torrecillo near Barranquitas and found there afterwards by one of the authors. Rediscovered in 1938 at Río Abajo Forest and near San Sebastian. One tree was found in Guajataca Forest in 1940 and later years."

Additional citations: PUERTO RICO: L. E. Gregory LEG.50 [Herb. Forest Serv. 99432] (W—2761802), LEG.154 [Herb. Forest Serv. 99433] (W—2761801).

CORNUTIA ODORATA (Poepp. & Endl.) Poepp. ex Schau. in A. DC., Prodr. 11: 681. 1847.

Additional & emended bibliography: Ettingsh., Blatt-Skel. Dikot. pl. 32, fig. 8. 1861; Stapf, Ind. Lond. 6: 479. 1931; Hill & Salisb., Ind. Kew. Suppl. 10: 61 & 244. 1947; Cuatrecasas, Revist. Acad. Colomb. Cienc. 10: 235. 1958; J. F. Macbr., Field Mus. Publ. Bot. 13 (5): 690 & 691. 1960; Moldenke, Phytologia 14: 427—428. 1967; Moldenke, Résumé Suppl. 16: 5 & 29. 1968; Moldenke, Fifth Summ. 1: 116, 123, 135, 140, 362, 470, & 471 (1971) and 2: 530, 727, 787, & 876. 1971; Altschul, Drugs & Foods 246. 1973; López-Palacios, Pittiera 5: 16. 1973; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 9 (12): 18 (1973) and 15: 24. 1975; Moldenke, Phytologia 32: 245. 1975.

Additional illustrations: Ettingsh., Blatt-Skel. Dikot. pl. 32,

fig. 8 [as Vitex umbrosa]. 1861.

Martin and his associates describe this plant as a small tree, 4--8 m. tall, the leaves strongly and pleasantly aromatic. In addition to months previously recorded by me in this series of notes, it has been found flowering in August. The corollas are described as having been "blue-violet" on Martin, Plowman, & Lau-Cam 1729 and as "violet" on their no. 1193. These collectors report that the leaves are macerated in water in Peru and used to wash the head in the treatment of earache, while the sapwood is heated in water and the water then dropped into the eyes in the treatment of eye-ache. The vernacular name, "oquera", is reported for it. Macbride (1960) calls it "A bush of stream banks, to over 2 meters tall, the large panicles of pale violet flowers with a strong lavender scent......sometimes a tree, 8 meters high." He also comments that "Northern forms with appressed or denser or less indument have been given taxonomic standing; the specific status of this entity is open to review."

Additional citations: ECUADOR: Los Ríos: Harling 375 (N). PERU: Loreto: Martin, Plowman, & Lau-Cam 1193 (Oa), 1729 (Oa).

CORNUTIA ODORATA var. CALVESCENS Moldenke in Fedde, Repert. Spec. Nov. 40: 179. 1936.

Additional bibliography: Moldenke, Phytologia 14: 427. 1967; Moldenke, Résumé Suppl. 16: 5. 1968; Moldenke, Fifth Summ. 1: 116 & 123 (1971) and 2: 876. 1971; López-Palacios, Pittiera 5: 18. 1973; López-Palacios, Revist. Fac. Farm. Univ. Los Andes 9 (13): 18 (1973) and 15: 24. 1975.

López-Palacios (1975) says that these plants are "Son arbolitos llamativos por su follaje, que por lo general es de un olor repugnante y viroso, y tienen hermosas flores azules....A orillas de la carretera, en la bajada de la Colonia Tovar hacia El Limón, en el Distrito Federal, he visto unos ejemplares jóvenes de hojas muy grandes, hasta de 53 cms. (López-Palacios 3009, MERF) que creo sean C. odorata var. calvescens, pero que aún no he registrado en mis trabajos porque en la época en que los vi (Diciembre 27-72) estaban muy jóvenes y se encontraban estériles."

Steyermark describes it as a tree, 15 m. tall, the leaves membranous, dull-green above and gray-green beneath, and the fruit dull-lavender. He found it growing at altitudes of 375—700 meters, in fruit in August.

Additional citations: VENEZUELA: Zulia: J. A. Steyermark 99904 (Ld, N).

CORNUTIA ODORATA var. COLOMBIANA Moldenke in Fedde, Repert. Spec. Nov. 40: 178--179. 1936.

Additional bibliography: Moldenke, Phytologia 14: 428. 1967; Moldenke, Fifth Summ. 1: 116 (1971) and 2: 876. 1971; Moldenke, Phytologia 32: 245. 1975.

Recent collectors describe this plant as a shrub, 3 m. tall, or a tree, to 15 m. tall, the "ramas muy largas y grandes", inflorescence terminal, the calyx reddish-purple, the filaments

and anthers purple, the fruit at first green, later turning pink, and have encountered it at the borders of fincas, flowering and fruiting in July, at 2000 meters altitude. The corollas are said to have been purple on Barclay, Juajibioy, & Gama 3596 and pale-blue on Uribe Uribe 3787.

The Barclay, Juajibioy, & Gama 3169, distributed as this variety, is actually C. microcalycina var. pulverulenta Moldenke.

Additional citations: COLOMBIA: Cundinamarca: Barclay, Juajibioy, & Gama 3596 (W—2702113). Tolima: Uribe Uribe 3787 (E—1988249).

CORNUTIA PUBESCENS Gaertn. f. in Gaertn., Fruct. & Sem. Pl. 3: 172, pl. 213. 1805.

Additional synonymy: Cornutia cayenensis DC. ex Goyena, Fl. Nicarag. 1: 568. 1911.

Additional bibliography: Goyena, Fl. Nicarag. 1: 568—568. 1911; Moldenke, Phytologia 14: 428. 1967; Moldenke, Fifth Summ. 1: 133, 362, 469, & 470 (1971) and 2: 876. 1971.

Goyena (1911) records this species from Nicaragua, but certainly in error. He records the vernacular name, "pujagüita de Catarina" for it.

CORNUTIA PYRAMIDATA L., Sp. Pl., ed. 1, imp. 1, 2: 628. 1753.

Emended synonymy: Cornutia flore pyramidato foliis incanis Plum., Nov. Pl. Amer. Gen. 32, pl. 17. 1703. Cornutia pyramidata Willd. ex Steud., Nom. Bot., ed. 1, 228. 1821 [not C. pyramidata Ait., 1789, nor Spreng., 1825].

Additional bibliography: [Retz.], Nom. Bot. 154. 1772; J. F. Gmel. in L., Syst. Nat., ed. 13, imp. 1, 2: 946 (1789) and ed. 13, imp. 2, 2: 946. 1796; Raeusch., Nom. Bot., ed. 3, 173. 1797; Desf., Tabl. École Bot., ed. 1, 54 (1804) and ed. 2, 64. 1815; Pers., Sp. Pl. 3: 359. 1819; Voigt, Hort. Suburb. Calc. 473. 1845; Kuntze, Rev. Gen. Pl. 2: 506. 1891; Hartl, Beitr. Biol. Pfl. 37: 293. 1962; J. Jiménez, Archiv. Bot. & Biogeogr. Ital. 43: 14. 1967; Moldenke, Phytologia 14: 428—429. 1967; Uphof, Dict. Econ. Pl., ed. 2, 154. 1968; Gibson, Fieldiana Bot. 24 (9): 196 & 198. 1970; Moldenke, Fifth Summ. 1: 69, 79, 81, 95, 100, 102, 105, 108, 110, 111, 132, 362, 378, 385, 420, 470, & 471 (1971) and 2: 529, 530, & 876. 1971; A. L. Moldenke, Phytologia 23: 319. 1972; Moldenke, Phytologia 23: 414, 415, 430, & 454 (1972) and 25: 238. 1973; Anon., Biol. Abstr. 67 (3): B.A.S.I.C. S.59. 1973; Moldenke, Biol. Abstr. 56: 1243. 1973; Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 126, 127, & 145. 1973; Hocking, Excerpt. Bot. A.23: 291. 1974; León & Alain, Fl. Cuba, imp. 2, 2: 313 & 314, fig. 135. 1974; Little, Woodbury, & Wadsworth, Trees P. R. & Virg. Isls. 2 [U. S. Dept. Agr. Agric. Handb. 449]: xii, 854, 862, 993—995, 1004, 1007, 1012, 1015, 1016, 1020, 1023, & 1024. 1974; Molina R., Ceiba 18: 66 (1974) and 19: 95. 1975; Moldenke, Phytologia 32: 235, 237, 238, & 240—243. 1975.

Additional illustrations: León & Alain, Fl. Cuba, imp. 2, 2: 313,

fig. 135. 1974.

Recent collectors describe this plant as a shrub, 2--3 m. tall, or a small bushy tree, 4--8 m. tall, the trunk 10--13 cm. in diameter at the base, the branches upright, the sap and leaves with a pungent odor, and the fruits black. They have found it growing in thickets, woody thickets along rivulets, thickets on bluffs overlooking the sea, on serpentine hills, on shrub-covered slopes, in stony places and weedy fields, and in scrub vegetation on hillslopes, from sealevel to 400 meters altitude, flowering in July, August, October, and November, and fruiting in August, October, and November. The corollas are said to have been "blue" on Jiménez 4771 and Liogier 11837, 11840, & 16579, "violet-blue" on Proctor 18212 and Wilbur, Dunn, Hespenheide, & Wiseman 7900, 8110, 8254, & 8309, "violet" on Proctor 16969, "lavender" on Wilbur, Dunn, Hespenheide, & Wiseman 7515, "purple" on Nicolson 1877, and "bright-purple" on Stern & Wasshausen 2453.

Raeuschel (1797) gives its destribution as "Ins. carib." Wilbur and his associates refer to it both as "occasional" and as "common" in Dominica; Jiménez calls it "very common" in the Dominican Republic, where Liogier refers to it as "very common locally". The vernacular names, "bois cassava", "cornutia pyramidal", and "palo vidrio", are recorded for it (in addition to the ones previously recorded by me). Junell (1934) has discussed the gynoecium morphology in great detail.

Little and his associates (1974) refer to C. pyramidata as "A very rare shrub or small tree [in Puerto Rico] to 15 feet high and 3 inches in trunk diameter, with light gray furrowed bark. He records the following vernacular names: "azulejo", "bois coral", "bois pou-poule", "bos [sic] cassave", "flor lila", "hoja de zope", "matasano", "pale de vidrio", "pangoge", "salvilla", "tzultesnuk", "zapilote", and "zapilote morado".

Uphof (1968) says that the blue fruits are a source of dye which is used by the Creoles of Dominica and the natives of Yucatán as a blue ink. When the juice is boiled with lime a red ink is obtained. The juice is occasionally used by the Carib Amerinds for coloring thread and cloth.

It should be noted here that the C. pyramidata accredited to Aiton is a synonym of C. coerulea (Jacq.) Moldenke, while that ascribed to Sprengel is C. latifolia (H.B.K.) Moldenke. It is also worth noting here that Steudel (1821) reduced C. pyramidata L. to synonymy under Hosta coerulea Jacq. [=Cornutia coerulea], but this is quite incorrect — it is only the Aiton homonym that should be disposed of in this manner. Desfontaines (1815) reduces Hosta coerulea Jacq. to synonymy under C. pyramidata, thus exactly reversing Steudel! Gibson (1970) actually reduces C. grandifolia var. intermedia, C. latifolia f. alba, C. lilacina, C. lilacina var. velutina, and C. pyramidata var. isthmica to synonymy under typical C. pyramidata. Kuntze (1891) says that "Die von Schauer in DC. prod. aufgeführten 6 Arten lassen sich

nicht aufrecht erhalten." So he proceeds to divide C. pyramidata into "α normalis. Folia lata (1: 1 1/2 — 2 1/2) acuta integerrima supra pubescentia subtus incana subtomentosa. Panama: Matachin. β dentata O. Ktze. Folia dentata cet. ut α. Costarica 1300 m......Ausser den seltenen var. dentata kann ich nur noch var. punctata OK (W.) als forma subglabra und var. longifolia OK. (Spr.) als forma angustifolia (1: 3 — 4) unterscheiden." Based on his type specimens, his var. normalis is now known as C. grandifolia var. normalis (Kuntze) Moldenke; his var. dentata is typical C. grandifolia (Schlecht. & Cham.) Schau.; var. punctata is C. coerulea (Jacq.) Moldenke; and var. longifolia is C. grandifolia var, purpusi Moldenke.

The Gentle 166, Harmon & Fuentes 5820, Ortíz 1095 & 2735, and Souza Novelo 49, distributed as typical C. pyramidata, are actually var. isthmica Moldenke, Ortíz 2106 is the type collection of var. isthmica f. albescens Moldenke, Kuntze 1332 is the type collection of C. grandifolia var. normalis (Kuntze) Moldenke, Enriquez 68, Gilly & Hernandez Xolocotzi 109, Lundell 433, and Ortíz 1095 & 1330 are C. latifolia (H.B.K.) Moldenke, and Molina R. 26232 and Pfeifer 1729 are C. lilacina var. velutina Moldenke. Lawrence 764 is a mixture of C. microcalycina var. pulverulenta Moldenke and something non-verbenaceous.

Additional citations: CUBA: Oriente: León 11841 (W—2289312), 19646 (W—2289730). HISPANIOLA: Dominican Republic: J. de J. Jiménez 4771 (W—2450239); A. H. Liogier 11837 (N, Z), 11840 (Ld, N), 16579 (Ac, N). LEEWARD ISLANDS: Dominica: D. H. Nicolson 1877 (W—2468602); Stern & Wasshausen 2453 (W—2566044); Wilbur, Dunn, Hespenheide,& Wiseman 7515 (W—2579012), 7900 (Au—272144, N, W—2579014), 7981 (W—2579013), 8110 (W—2578988), 8254 (Au—272129, Mi, N, W—2579010), 8309 (Au—272117, Mi, N, W—2579011). WINDWARD ISLANDS: Grenada: G. R. Proctor 16959 (W—2613795). St. Lucia: G. R. Proctor 18212 (W—2585113); Sauer 4331 (Ws).

CORNUTIA PYRAMIDATA var. ISTHMICA Moldenke in Fedde, Repert. Spec. Nov. 40: 187—188. 1936.

Synonymy: Cornutia pyramidata var. ismithia Moldenke, Phytologia 23: 430, in syn. 1972.

Additional bibliography: Moldenke, Phytologia 14: 429. 1967; Gibson, Fieldiana Bot. 24 (9): 196. 1970; Moldenke, Fifth Summ. 1: 69, 79, & 81 (1971) and 2: 876. 1971; Moldenke, Phytologia 23: 414, 415, 430, & 454. 1972; Anon., Biol. Abstr. 56 (3): B.A.S.I.C. S.59. 1973; Moldenke, Biol. Abstr. 56: 1243. 1973; Hocking, Excerpt. Bot. A.23: 291. 1974; Moldenke, Phytologia 32: 242. 1975.

Recent collectors describe this plant as a shrub, 1—10 m. tall, or a tree, 6.5 m. tall, the trunk 3—15 cm. in diameter,

and have encountered it in second growth, pine savannas and thickets, moist thickets in the savanna-rainforest transition zone, and on flat terrain of savannas with dark-red clay soil, at altitudes of 100 to 580 meters, flowering from May to July, and report the vernacular name, "chiople-kaax". The Lundells refer to it as "rare in dooryard and along street", perhaps implying its existence in cultivation in Yucatán. The corollas are said to have been "purplish" on Matuda 3398, "purple" on Souza Novedo 49, "bluish-purple" on Lundell & Lundell 7888, and "violet-blue" on Ortíz 2735.

Gibson (1970) reduces this variety to typical C. pyramidata L. and comments that "The indument of West Indian plants is albidous, while that of Central American species [sic] is usually fulvous, roseate, or purplish, but they differ in no other respect".

Material of var. isthmica has been widely distributed in herbaria as C. latifolia (H.B.K.) Moldenke or typical C. pyramidata L. On the other hand, the C. L. Lundell 433, Ortíz 1095, and Sorensen 7067, distributed as C. pyramidata var. isthmica, seem better placed as C. latifolia (H.B.K.) Moldenke.

Additional citations: MEXICO: Tabasco: Matuda 3398 (F—1028209, Ld, Mh, Mi, N). Yucatán: Lundell & Lundell 7888 (Du—363078, Ld, Mi, N, Se—165598); Souza Novelo 49 (Tu—98523). GUATEMALA: El Petén: Cox 3056 [Herb. Cox 1765] (Oa), 3343 [Herb. Cox 1804] (Oa); Harmon & Fuentes 5820 (N); R. T. Ortíz 1095 (N), 2735 (W—2740069). BRITISH HONDURAS: Gentle 16 (F—696392, N).

CORNUTIA PYRAMIDATA var. ISTHMICA f. ALBIDA Moldenke, Phytologia 23: 454. 1972.

Bibliography: Moldenke, Phytologia 23: 415 & 454. 1972; Hocking, Excerpt. Bot. A.23: 291. 1974.

Citations: GUATEMALA: El Petén: R. T. Ortíz 2106 (N—type).

CORNUTIA THYRSOIDEA Banks & Moldenke ex Moldenke in Fedde, Repert. Spec. Nov. 40: 193—195. 1936.

Emended synonymy: Cornutia thyrsoidea Moldenke, Phytologia 14: 429, in syn. 1967; C. D. Adams, Flow. Pl. Jam. 636. 1972.

Additional bibliography: Hocking, Excerpt. Bot. A.12: 426. 1967; Moldenke, Phytologia 14: 429. 1967; Moldenke, Résumé Suppl. 15: 20. 1967; Moldenke, Biol. Abstr. 49: 4199. 1968; Moldenke, Fifth Summ. 1: 100, 362, & 471 (1971) and 2: 876. 1971; C. D. Adams, Flow. Pl. Jam. 636 & 811. 1972; A. L. Moldenke, Phytologia 23: 319. 1972.

Adams (1972) says of this species "Uncommon, in woodland margins on limestone hills; 1000—3000 feet; fl. May—Sept, fr. June, Harris 5199 & 9252, Powell 554, Proctor 10259; endemic."

ADDITIONAL NOTES ON THE GENUS AVICENNIA. V

Harold N. Moldenke

Herbarium acronyms employed in this and in all of the other installments of these "Additional notes" are explained in full in my "Fifth Summary", pp. 795—801 (1971) and its supplements.

AVICENNIA L.

Additional & emended synonymy: Horau Adans., Fam. Pl. 2: 80 & 585. 1763. Auicennia Reichard in L., Gen. Pl., ed. 8, index. 1778. Racua J. F. Gmel. in L., Syst. Nat., ed. 13, imp. 1, 2: 1612. 1789. Corna Noronha, Verh. Batav. Gen. 5, ed. 1, art. 4: 2. 1790. Racka Bruce ex J. F. Gmel. in L., Syst. Veg., ed. 13 rev., imp. 1, 2: 245, in syn. 1791; Wittstein, Etymol.-bot. Handwörterb. 749. 1852. Halodendron Roem. & Schult. in L., Syst. Veg., ed. 16, 3: 485. 1818 [not Halodendron P.DC., 1825]. Avicenia Dum., An. 22. 1829; Pfeiffer, Nom. Bot. 1 (2): 1847, in syn. 1874. Avicenia W. Griff., Notul. Pl. Asiat. 4: 173, sphalm. 1854. Avicinnia W. Griff., Notul. Pl. Asiat. 4: 189, sphalm. 1854; Ambasht, Text-Book Pl. Ecol. 169 & 191, sphalm. 1969. Avicenia L. apud Masamune, Sci. Rep. Kanazawa Univ. 4: 50. 1955. Avucenuia L. ex Moldenke, Phytologia 7: 140, in syn. 1960. Saltzmanna Roxb. ex Moldenke, Phytologia 7: 140, in syn. 1960. Avicenna Farnsworth & al., Lynn Index 6: 263, sphalm. (1969) and 7: 228. 1971. Avincennia Whipple, Journ. Elisha Mitch. Sci. Soc. 88: 13, sphalm. 1972.

Additional & emended bibliography: P. Herm., Mus. Zeyl., ed. 2, 36. 1726; L., Syst. Nat., ed. 1, [7]. 1735; L., Crit. Bot. 91 & [274]. 1737; L., Gen. Pl., ed. 1, 27, 180, & [386]. 1737; L., Meth. Sex. Gen. Pl. 6, 91, & [274]. 1737; L., Gen. Pl., ed. 2, 44 & [530] (1742) and ed. 3 ["2"], 36—37 & [416]. 1743; L., Syst. Nat., ed. 7, 87 & [226]. 1748; L., Gen. Pl., ed. 4, 36—37, 415, & [444]. 1752; L., Sp. Pl., ed. 1, imp. 1, 1: 110—111. 1753; L., Gen. Pl., ed. 5, imp. 1, 49 & [503]. 1754; P. Browne in Sloane, Civil & Nat. Hist. Jamaic., ed. 1, imp. 1, 263. 1756; L., Syst. Nat., ed. 8, 94 & [230] (1756) and ed. 10, 2: 883, 894, & 1122. 1759; Adans., Fam. Pl. 2: 12, 80, 200, & 201. 1763; L., Gen. Pl., ed. 6, 579 & [583]. 1764; L., Sp. Pl., ed. 3, 2: 891. 1764; Burm. f., Fl. Ind. 138. 1768; [Retz.], Nom. Bot. 156 & [281]. 1772; Planer, Gatt. Pfl. 2: 578—579 & 1053. 1775; Romans, Concise Nat. Hist., ed. 1, 6. 1775; Reichard in L., Gen. Pl., ed. 8, 328. 1778; J. F. Gmel. in L., Syst. Nat. Veg., ed. 13, 2: 213, 245, 888, 963, & 1612. 1789; Noronha, Verh. Batav. Gen. 5, ed. 1, art. 4: 2. 1790; Haenke in L., Gen. Pl., ed. 10 ["8"], 2: 537 & 791. 1791; L., Syst. Nat., ed. 13 rev., imp. 1, 1: 245. 1791; Schreb. in L., Gen. Pl., ed. 9 ["8"], 2: 428 & 844. 1791; J. F. Gmel. in L., Syst. Nat., ed. 13 rev., imp. 2, 2: 213, 245, 888, 963, & 1612. 1796;

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Type species: Avicennia officinalis L.

Horau Adans. is placed in the synonymy of Laguncularia Gaertn., of the Combretaceae, by Jackson (1893, 1946, 1960) and the only binomial published in it is a transfer from Laguncularia, but Airy Shaw (1966) and Dandy (1967) affirm that it actually belongs in the synonymy of Avicennia.

Padmanabhan (1962) comments that "Avicennia has been separated from the Verbenaceae on the basis of wood anatomy, articulate branches, imbricate scale-like prophylla, the free central placentation, and the pendent orthotropous ovules", but "The author has re-examined the question, and has come to the conclusion that 'the morphological modifications and degree of aggressiveness in the haustorial activity of Avicennia appear to be more of a quantitative variability than of a qualitative one......a summation of embryological characters does not warrant the creation of an independent monotypic family to accomodate the genus Avicennia'".

On the other hand, however, it should be pointed out again that the Avicenniaceae, as a separate family, has been accepted

by many distinguished botanists in the past, including taxonomists, plant morphologists, wood anatomists, and ecologists, and is being accepted today by an ever-increasing number of careful workers. Among these may be mentioned Saint-Hilaire (1826), Endlicher (1838, 1841), Miquel (1845), Schnitzlein (1856), Bocquillon (1862), Eichler (1875), Van Tieghem (1898), Warming (1912), Small (1913, 1933), Van Tieghem & Constantin (1918), Record & Mell (1924), Record (1934), Frey-Wyseling (1935), Pulle (1937), Croizat (1944), Buswell (1945), Erdtman (1945, 1952, 1961), Alain (1946), Hodge & Gutierrez Villegas (1948), Barkley (1948, 1949), Den Berger (1949), Angely (1960, 1970), Allan (1961), Hepper (1963), Gooding, Loveless, & Porter (1965), Airy Shaw (1966, 1973), Duke (1969), D. S. & H. B. Correll (1972), Aubréville & Leroy (1972), Letouzey (1972), Jafri (1973), Mukherjee & Chanda (1973), Sowunmi (1973), Villiers (1973), Rouleau (1974), Täckholm (1974), Troncoso (1974), etc. Dandy (1967) says "Avicenniaceae, olim Verbenaceae". Airy Shaw, in the 7th and 8th editions (1966, 1973) of Willis' "A Dictionary of Flowering Plants", not only adopts it as a valid family, but relates it to the Salvadoraceae rather than to the Verbenaceae. Van Tieghem & Constantin (1918) actually create an order, Avicenniales, for it, including in the order also the Symphoremaceae and Harmandiaceae, and this classification is followed by Gibbs (1974), who notes that if the Avicenniaceae really belong in an order of the Santalineae, as Van Tieghem & Constantin maintained when they created the Order Avicenniales, then "we might expect its members to have acetylenic compounds, but I have no information on this point."

Barkley (1965) rightfully keeps Avicenniaceae as a separate family. He classifies it, along with the Symphoremaceae, Globulariaceae, Myoporaceae, Tetrachondraceae, Selaginaceae, and Lamiaceae, in the Order Lamiales (Order 83), but places the Verbenaceae, along with the Phrymaceae, Cordiaceae, Ehretiaceae, Chloanthaceae, Stilbaceae, and Duckeodendraceae, in a separate Order Verbenales (Order 61). He lists Hilairanthus as a valid genus, but in my opinion its characters are not sufficient to warrant its segregation from Avicennia.

Bharucha (1947) tells us that although Avicennia differs ecologically from land plants, it does not seem to differ physiologically from them during the first 8 days of germination.

Dieffenbach (1843) places the genus Avicennia in the Myoporineae (=Myoporaceae); Goyena (1911) regarded it as comprising the Tribe Avicenieas Meisn. Duke (1969) enumerates the following contrasting characters between the Avicenniaceae and the Verbenaceae: In the Avicenniaceae: germination phanerocatylar, one cotyledon conduplicate about the other, slightly unequal, broadly reniform, subcordate, sometimes emarginate; eophylls supracotyledonary, opposite, decussate with the cotyledons, entire, lanceolate to ovate, weakly penninerved. In the Verbenaceae: germination phanerocotylar, the cotyledons ovate, entire, subtriplinerved,

short-petioled; eophylls supracotyledonary, opposite, decussate with the cotyledons, more often dentate than the metaphylls; indument often diagnostic, e.g., the punctate glands of Tectona impart a red-spotted outline of the seedling to the newspaper in which it is pressed.

Mukherjee & Chanda (1973) have reviewed the "biosynthesis of Avicennia L. in relation to taxonomy" and conclude that "The common mangrove genus Avicennia is provided with some typical characters like differential wood anatomy, articulate branching, free-central placentation, 3-colporate pollen with lolongate ora and reticulate surface pattern, etc. These characters suggest that it should not be retained in Verbenaceae. The collective morphological (gross and pollen), and anatomical characters found in combination in Avicennia are not encountered in any other mangrove species. Avicennia happens to be the only verbenaceous member which serves as a major constituent of mangrove community. Gross and pollen morphological characters, typically found in Avicennia are not exhibited in any other member of Verbenaceae. It's affinity with Verbenaceae was drawn from the assumption that Avicennia originated from tropical East Asian and Malaysian Symphoremoideae consisting of Congea, Symphorema and Sphenodesme [now constituting the Symphoremaceae] during Tertiary Period and later flourished in the tropical coastal regions. Considering the above factors it seems that the segregation of Avicennia to form a family for itself is justified."

These authors state that "The characteristics of wood anatomy of Avicennia is [sic] different from the arboreal verbenaceous members. Although ecologically Avicennia is regarded as an important constituent of mangrove community, it has practically no anatomical resemblance with any other mangrove species....The characteristic vessels, fibres, ray and wood parenchyma, etc., of Avicennia present a distinct variability in wood anatomical structures from the scanty arboreal Verbenaceae. Moreover, the general outline of Avicennia stem is ribbed hexagonal while other verbenaceous members have either square or round or triangular ribbed stem. This may also be regarded as a criterion for segregation. Pollen morphologically Avicennia is distinctly different from all other verbenaceous members. The presence of tricolporate aperture with lalongate ora which are confined within the limits of colpi coupled with reticulate surface ornamentation are absent from other members (170 species from 55 genera) of Verbenaceae......Pollen morphologically Avicennia pollen types are regarded as more advanced than any other verbenaceous member so far as primary and secondary characters, i.e., apertural configurations and surface patterns are concerned, as 3-colporate composite aperture with lolongate ora is considered to be more advanced than 3-colpate or 3-colporate with lalongate ora...... Regarding surface pattern, it is considered that these types which serve to provide maximum protection to germplasm are prim-

itive. Thus, the line of evolution is considered to run from grains with excrescences to grains without excrescences or tectum."

Bullock (1958) accredits the name, Avicenniaceae, to Schnitzl., Ic. Fam. Nat. 2: pl. 107 (1856), which is correct, but in his later (1959) work he credits it to Endl., Ench. Bot. 314 (1841). Endlisher, however, in the reference cited, proposed an "Avicennieae", not an Avicenniaceae. Saint-Hilaire (1826) similarly recognized the family status of the group, but did not propose the actual name which we must use for it now. It was Schnitzlein who actually first proposed the name with the proper family termination as now accepted. It is, therefore, Schnitzlein's name which should appear as authority for the name, not either Saint-Hilaire's nor Endlicher's.

Plant anatomists tell me that the anatomical wood characters of Avicennia are quite unique; embryologists and morphologists stress the very different ovary characters; ecologists stress the habit and habitat. Palynologists have recently done considerable work on the pollen of the genus. For instance, Mukherjee (1974) says "It may be postulated that the 3-colporate aperture with lalongate ora encountered in verbenaceous Avicennia.....in the course of evolution perhaps broke into two lalongate ora which got separated and gave rise to such apertural condition[s] as are found in the grains of Myoporaceae. This may give rise to apertural types encountered in Phrymaceae or perhaps the Avicennia pollen gave rise to the vestigeal type of di-orate condition encountered in Phrymaceae which ultimately culminated in Myoporaceae. This theory is strengthened by occasional presence of lalongate ora in Phryma. Punt (1967).....is of the opinion that palynologically the trend of evolution in composite apertural type runs from lalongate to lolongate ora to di-orate condition. Moreover, surface of pollen grains of Avicennia, Phryma and Myoporum, Eremophila and such other genera possess the same type of pattern. The morphological similarity between Myoporaceae and Avicennia as was suggested by Wernham (1912) is also in favour of the theory based on pollen morphology."

Croizat (1944) was of the opinion that Avicennia is "absolutely!" not a member of the Verbenaceae, but is "a strange child of the Dipterocarpaceae and the Ancistrocladaceae".

Chapman (1970) proposes the following ecologic group terms: Alliance Avicennietalia; Order Avicennion occidentalia (Associations Avicennietum nitidae and Avicennietum africanae) and Order Avicennion orientalis (Associations Avicennietum marinae, Avicennietum resiniferae, Avicennietum albae, Avicennietum officinale, Avicennieto albae-A. marinae, and Avicennieto-Excoecarietum).

Fryns-Claessens & Cottham (1973) report that Avicennia plants have diamesoperigenous type stomata in their leaves. Backer & Bakhuizen (1965) report that in Java Avicennia trees are sometimes deliberately planted between and along coastal fishponds.

Göbel (1905) affirms that "*Avicennia* forms, as it were, the transition amongst mangroves to the viviparous plants in which the fruit-wall is not bored through on the mother-plant; its seedlings are set loose, sometimes invested by the fruit-wall, at other times without it. They have stiff upwardly curved hairs upon their hypocotyl, and these serve for the first fixation in the mud." Ven Katesan (1966) describes the "seeds of *Avicennia*" as "semi-viviparous". He reports that in India the local species are occasionally used as rough walling, fuel, and a good fodder and that they are "non-copping". Navalkar (1956) reports that in the same country the growing leaves are fed upon by "cows, bulls, and buffalo". Thanikaimoni, in a personal communication to me, asserts that in parts of the Indian coast the leaves are so completely cropped that identification of the plants is often rendered very difficult.

Photographs illustrating the browsing of *Avicennia* plants by goats at Mizny, Gujarat, India. Photographs by courtesy of Dr. G. Thanikaimoni, Institut Français, Pondichery, July 23, 1975

Other authors have described the seeds as without endosperm and viviparous, with epigeal germination. Hepper (1963) speaks of the embryo as viviparous. Baker (1900) refers to "the plumule growing out before the seed falls". Ten & Keng (1969) maintain that "Avicennia seeds are viviparous, exhibiting epigeal germination. The well-developed embryo possesses a pair of leathery, conduplicate cotyledons. Leaves show typical xerophytic features. Stomata are often of the caryophyllaceous type, and confined to the lower surface. Petioles are characterized on the adaxial surfaces by grooves which are lined by glands and trichomes. Three bundles form the vascular supply of the petioles. Young stems exhibit anomalous growth in the form of included phloem arranged in concentric rings. Phellogen arises subepidermally. In the vasculature of the 4-lobed corolla, 3 species have 4 traces each supplying cone corolla-lobe: in A. officinale [sic], an additional trace runs into the posterior corolla-lobe, This suggests that the 4-lobed corolla is probably derived from a 5-lobed form. The ovary is bilocular at the basal part, but in the upper level only a 4-angled central axis is present. The incompletely free-central placentation is probably a modification of the axile placentation."

Martin (1946) confirms the absence of endosperm. Rendle (1967) speaks of the stem increasing "in thickness by repeated production of new cambiums and concentric with the original one" and comments on the "unusual embryology" described by Treub (1883).

Letouzey (1972) says for A. africana that "cette graine germe sur l'arbre même, comme chez les vrais palétuviers." Villiers (1973) reports for what he calls A. germinans: "A. germinans est une plante vivipare: l'embryon se développe dans le fruit; il est déjà unde plantule quand il se sépare de l'arbre."

Yet in spite of all the above testimony, Uphof (1941) makes the amazing statement that there is no vivipary in Avicennia!

Williams (1949) avers that in Zanzibar members of this genus are known as "mchw" and that the trunks are used for fuel in lime-burning operations in less inundated sites.

Burkill (1966) gives the following brief review of the taxonomy and economic value of the genus: "The species of the Indian and Pacific Oceans have yellow flowers, while those of the Atlantic have white ones; there are other differences in the ovary and the embryo which marke them off into two botanical groups, but in general appearance they are very similar. The Asiatic species run into one another, and the views which have been published on their definition are most difficult to bring into line. The last, and probably the best on the Malayan species, is that to be found in Watson's account of the Mangrove forests (.....1928). He recognized four species: Ridley had recognized five, his fifth, A. sphaerocarpa, being represented by a Penang plant which Watson considers not to differ from A. intermedia. Bakhuizen (....1921), on the other hand, collected all the Malayan plants known to him into two species, and Merrill (......1923) followed him. The simpler division of Bakhuizen and Merrill admits A. marina as a

tree with small flowers only half a centimeter across (2/10 in.), and holds A. officinalis to be a tree with large flowers, 1 — 1 1/2 cm. across (4/10 — 6/10 in.); Bakhuizen supplements this by differences in the amount of silky hair on the ovary and in the stigma. Ridley's and Watson's A. officinalis is the same species as Bakhuizen's and Merrill's; their other species are put into Bakhuizen's A. marina, but, of this, varieties are freely recognized.

"Against Bakhuizen's classification one obvious objection is found in the dissimilarity of the habitat of the Red Sea plant, which is the original A. marina, on the shore of a very saline sea, and his A. marina var. alba, which is found away from the salt water, up creeks into which an abundance of fresh water descends. This plant will here be called A. alba, as it seems best to regard it as a species. Watson gives its flowers as the least of the four in Malaya, but the flowers of A. intermedia and A. lanata are only a trifle larger. The fruit of A. officinalis is the largest and thickest through; the others constitute a series from A. marina to it.

"It is useless to endeavour to assign much of what has been written on the utility of Avicennias to particular species, and it will not be attempted here.

"The Malays and Javanese call all the species 'api-api', and as showing that this name is an old one, it may be added that it is used in the form of 'afi-afi' in Madagascar. The Siamese call all 'sama tale'. Apparently the Semang use 'itil' for any of them, and 'ki balanak' is a comprehensive Sundanese name.

"The timber (Foxworthy.....1921) is hard and moderately heavy; very coarse-grained; brittle, but difficult to split; the sap-wood pale grey; the heart-wood, when present, olive-brown to purple; and it is interesting that when freshly cut the heart-wood floats, but the sap-wood sinks. As the trees are usually crooked, no length of timber can be got. It gives indifferent firewood. Writers such as Low and McNair did not refer to it when calling 'api-api' a very good or excellent firewood, for indeed it is not liked because it cannot be split, though the name 'api-api' may indicate firewood. It is used, however, when better is not easily procurable. It burns smoulderingly. The fisher-folk like it for smoking fish, to which it is said to give an agreeable flavour. It is used, also, for smoking rubber.

"Foxworthy summed up regarding it: 'altogether it is a very unsatisfactory wood — the least useful of the mangrove-swamp woods -- and the tree is usually considered as a weed in the swamp.

"The durability is said to be poor, though beetles rarely attack it. Foxworthy & Woolley (....1930) showed this by experiments. It is used for rice-mortars and has been suggested for paving-blocks (Schneider.....1918); but the last seems unreasonable.

"Its structure is peculiar, by reason of an irregular layering, which one writer has tried to connect unsuccessfully with the periodicity of spring and neap tides (see Gamble....1922....and Baker...1916). Baker, commenting on the structure, compares it to 3-ply wood on account of the crossing of the grain, and he adds that though it will not split radially it is more easy to split tangentially than any timber known to him. The Australian aborigines, taking advantage of this, made shields from it. Baker declares that it is impossible to kill the tree by ringing it, as a result of the structure of the stem.

"This structure has been described in considerable detail by him (op. cit.) and by Jansonnius (....1926...). Older writers have said that the bark serves as a tanning agent in India and elsewhere; but in reality it is of little use in tanning. Pilgrim (.. 1924...) says of the genus in Tenasserim: 'the bark will make leather, but its analysis always gives poor figures for tannin-content (2.5 to 5 per cent)....Baker....similarly gives the tannin-content as low. Nevertheless, Gerini (...1911...) says that nets are dyed brown with its bark; to which statement it may be added that further investigation is indicated.

"The fruit may be eaten at times, Bakhuizen quotes an Arab author, who says that it causes dizziness. Rumpf recorded it as a famine-food of Celebes — not the whole fruit, but the seeds, which are boiled and soaked in water for a fortnight to remove their acridity as far as possible, before they are eaten. K. Heyne (....1927..), after repeating this, adds that the fruit may be eaten even in normal times by the fisher-folk of Celebes, and in Java. About Batavia, the fruit is boiled and then sun-dried.... Ridley records, against a specimen of A. officinalis, that it may be eaten in Singapore. Watt...., without giving precise information about localities, says that the kernels are bitter but edible: presumably he meant that they are eaten in India. Baker.....says that the aborigines of Australia freely eat the fruits roasted.

"About the Red Sea and the Persian Gulf, where fodder is a thing of much value, the leaves of A. marina are eaten by camels...... Paranjpye (....1920...) says that branches of Avicennia are cut and fed to cattle in the Ratnagiri district of the west coast of India. He calls the species A. officinalis, probably meaning either of the two which may occur there. It is not known that Avicennia leaves are used elsewhere, but it is interesting to know that they can be used.....Baker....says that cattle eat the leaves of the Australian Avicennia, or Grey Mangrove, with great relish.

"A green, bitter and somewhat aromatic resin oozes from the bark. This resin is medicinal round about the Indian Ocean. An Arab writer calls it an aphrodisiac, and adds that it may also be applied for toothache. In western Java it is considered a contraceptive, and is taken over indefinitely long periods....This use is given also by Ridley as known among the Malays...but in his prescription the abortient juice of a young pineapple is associated. Watt....says that the roots possess aphrodisiac properties. He says that unripe seeds are used as a poultice to hasten boils

and abscesses to maturity. His information is given under the name A. tomentosa, but may apply to any one of the Indian species.

"The ash, after burning the wood, is used as soap in India.... and Baker tells us that early settlers used it similarly in Australia. There is a large amount of alkali in it. Baker gives an analysis. Wood-tar was made from it experimentally by Wells, and reported on (1917)."

Brown (1969) reports that "the respiratory gaseous exchanges of detached whole mangrove seedlings of the genera Avicennia, Bruguiera, and Rhizophora in a range of O_2 concentrations from 0.21 percent (air) were markedly reduced by the presence of external CO_2. Aerobic respiration decreased steadily for 16 days but the respiratory quotient (RQ) remained at unity. In anoxia CO_2 output fell to half that in air. Ethanol accumulation was negligible but, relatively, acetaldehyde values were higher than in older tissues. Lactate accumulated initially but later decreased. On return to air CO_2 output was elevated above control values in a pattern resembling the previous lactate accumulation. The extent of the burst was too great, and the RQ too low, to be explained entirely by lactate oxidation. In 5 or 10 percent O_2 the CO_2 outputs were below those in inoxia and the RQ eventually rose to 1.4 suggesting the induction of fermentation. The absence of ethanol, acetaldehyde or lactate indicates that CO_2 was released from reactions other than those in the Embden-Meyerhof pathway. Tissue slice CO_2 outputs decreased with lowered O_2 concentrations and the RQ was always above unity except in air. The burst on return to air was absent, suggesting that slicing affects decarboxylation mechanisms."

Stace (1966) checked the leaf epidermal characters of 8 mangrove genera in the Combretaceae, Rhizophoraceae, and Avicenniaceae with each other and with non-mangrove genera in the same or reputedly related families. He states that "mangrove genera share a number of common features, but are easily separated into 3 groups coinciding with the 3 families. Differentiation by epidermal characters thus clearly parallels that by characters more usually used in plant taxonomy."

Gibbs (1975) reports the presence of lapachol (a 1,4-naphthaquinone) and tannins, but the absence of leucoanthocyanins and the absence or probably absence of saponins.

Gessner (1967) states that Avicennia species store less water in their leaves than do Rhizophora species. Removal of all pneumatophores caused no visible harm to the plants even after many months. Pneumatophores similar to those in Avicennia are seen also in Sonneratia.

Breen & Hill (1969) investigated the events that led up to the mass mortality of mangroves in the Kosi estuary in 1965 and have concluded that flooding of the estuary following the closure of the mouth for 5 months was responsible. "Avicennia marina, will, however, probably make a comeback and remain there."

Macbride (1960) says for the genus Avicennia as a whole that

"The dark brown hard wood is very durable. The name recalls Ibn Sina, erudite Persian" physician of Bokhara, born in 980, died in 1037, whose "Quan um" (canon of medicine) was a synthesis of all the medical knowledge and wisdom available at the beginning of the 11th century in that part of the world.

Thomson (1964) avers that the leaves, flowers, and fruits of Avicennia are eaten by hoatzins (Opisthocomus hoatzin) in northern South America.

Van Steenis (1969) claims that the stratigraphic distribution of Avicennia pollen in northern South America and in Nigeria goes back to the Upper Miocene; Muller (1964) reports it in the Lower Miocene of Borneo, while Fosberg (1969) tells us that the Middle Miocene in Borneo has "Avicennia type" pollen well preserved in fossil form. In this connection it should be recalled that A. eocenica Berry is described from the Eocene of Tennessee, A. germinans (L.) L. from the Pleistocene of Trinidad, A. lanceolata (Engelh.) Moldenke from the Tertiary of Colombia, A. miocenica Berry from the Miocene of Colombia, and A. nitidaformis Berry from the Eocene of Mississippi.

Caratini, Blasco, & Thanikaimoni (1973) comment that "The mangroves are [form] tidal forests which occupy an exacting littoral habitat, almost invariably salt or brackish water and coastal silt: clay and sand in various proportions, in exceptional cases sand only. Their distribution is restricted to tropical shores.....The presence of pollen grains of Rhizophoraceae, Nypa and Sonneratia in a given sediment imply the occurrence of a mangrove [forest] in the immediate vicinity. Palynological studies (Muller, 1964) have revealed the presence of mangroves in the Quaternary and Tertiary periods. Such studies not only give us an idea of the palaeoclimate but sometimes even permit us to locate the ancient shore lines....Three principal vegetation zones can be recognized in the mangrove region of Pichavaram [India] viz. Rhizophora zone, Avicennia zone and back-mangrove [a bushy formation of mostly halophyte shrubs]. The pollen analysis of recents (sic) sediments from this region gives an image of the vegetation quite different from the actual floristic composition. The extent of this deviation seems chiefly due to the over-representation of the pollen grains of Rhizophoraceae and Sonneratiaceae, under-representation of the pollen grains of Avicennia, absence of the pollen grains of several mangrove species and the presence of a number of allochthonous pollens which constitute nearly 25 percent of the total pollen grains extracted from the sediments."

Cooke (1961) records the fungus, Schizophyllum commune, from Avicennia stems; other workers have found members of the genus attacked by Leptosphaeria avicenniae, Mycosphaerella pneumatophorae, and Sphaeronema avicenniae. Rogerson (1971) adds Macrophoma sp., Rhabdospora avicenniae, and Zalerion varium to the list, while Kohlmeyer (1968) lists Didymosphaeria enalia, Lul-

worthia sp., Parliomyces lentiferus, Torpedospora radiata, Culcitalna achraspora, and Phoma sp.

Rehm & Humm (1973) report that Sphaeroma terebrans, wood-boring isopod, is destroying the prop roots of red mangroves (Rhizophora mangle) along the southwestern coast of Florida to such an extent that the Ten Thousand Islands and mangrove fringes of the mainland are steadily shrinking. What effect this will have on the Avicennia communities of the region is not yet obvious. Mangroves of the Florida Keys (on the east coast) are as yet free of this wood borer.

It is probably worth recording here that the original notation by Linnaeus relating to Avicennia (1735) reads "Avicennia † Oepa HM." Planer (1775) lists the German vernacular name, "Avicennie". One of the earliest references to Avicennia is that of P. Hermann (1726) who records it as "BULATWAELA Tambul pro Tembul Avicennae. Betre. Garc. Betele Vid. fol. 32."

The Endlicher reference cited in the bibliography of this genus is often cited as "1836-1856", but the pages involved here were actually issued in 1838. The Foreman (1972) reference has "1971" on its title-page, but was not actually issued until 1972. The Angely (1971) reference is often cited as "1970", but was not actually published until 1971; the Emould (1922) reference has "1921" on its title-page. The Schumann & Lauterbach (1900) reference bears a "1901" date on its title-page, but was received in the New York Botanical Garden library on July 12, 1900.

The Palisot de Beauvois, Fl. Oware reference is often cited as "1805" or "1809", but actually was published in 1806; similarly, the W. Griffith (1846) reference is often cited as "1851", the title-page date, but pages 1—162 actually appeared in 1846, pages 163—358 in 1847, and only pages 359—510 in 1851.

Villiers (1973) asserts that "Avicenia" is used by Linnaeus in his Sp. Pl. 1: 110 (1753) and "Avicenna" on page 116 of the same work, but I fail to find either word used on the pages specified.

Clarke & Hannon (1970) report that the tolerance of Avicennia and Aegiceras seeds and seedlings to seawater in the Sydney, Australia, region is greater than that of Triglochin, Sporobolus, and Juncus, but less than that of Arthocnemum and Suaeda of common mangrove formation genera there. Huxley & Bramwell (1973) report that in southeastern Asian mangrove formations the carnivorous mudskipper, Periophthalmodon schlosseri, makes its home in the firmer mud within the fringe of the Avicennia zone.

Ogura (1940) asserts that, unlike those of Urandra, but like those of Sonneratia, the aerial roots of Avicennia are essentially dissimilar in structure (cortex and vascular bundles) to the subterranean ones. The thick aerial root of Taxodium is also similar but is formed by an abnormal growth of the dorsal part of the subterranean root. "These aerial roots of Sonneratia, Avicennia and Taxodium are believed to be developed for respiration and are called in general, since Goebel (1886), as respiratory roots, though

recently Troll and Dragendorff (1931) describe them as organs, which furnish the places for branch roots."

Puri (1960) reports that Avicennia is associated with Rhizophora and Acanthus on the west coast of Malabar and is a common shrub there. In the edaphic forests on Coco Island inward from the beach there is an edaphic mangrove swamp in the lower ground and on the ridges, including Avicennia, Rhizophora, Bruguiera, Ceriops, and Aegiceras. It occurs in the edaphic tidal forests in the Ganges delta and in the mouths of other rivers; also with Ceriops roxburghiana in the low edaphic mangrove forests along the edges of waterways in river deltas on the east coast of India, and a little on the west coast on soft tidal mud submerged by salt water at evertide, forming dense forests of low trees 10—20 feet tall. It is common also in the Sunderbans forests and the southern part of the Ganges delta where the mangrove formation has much fresh water carried in from the rivers and is composed most densely of Rhizophoraceae. The edaphic mangrove forests of Bombay Presidency include Avicennia officinalis. It grows with Rhizophora mucronata on the perpendicular banks of the Chakaria Sunderbans in India.

Berry (1972) has studied the fauna of the Malayan mangrove lagoons and has found there 8 species of polychaete worms, 1 sipunculate worm, 34 crustaceans, 11 bivalves, 35 gastropods, and 5 mudskippers.

Richards (1964) reports that in the regions of the world with tropical rainforests "marine angiosperms are less abundant. The Rhizophora community may persist for a long time as a nearly pure consocies or it may change rapidly by the invasion of other species which are able to grow on the firm soil and in the shelter provided by the Rhizophora. If the community changes, an inner zone of the mangrove Avicennia, generally associated with low-growing salt-marsh plants, may develop....In the 'Avicennia-salt-marsh associes'.....behind the outer Rhizophora consocies, on land which is regularly or only occasionally submerged, there is typically a zone dominated by Avicennia nitida. This forms an open forest, in striking contrast to the thickly tangled Rhizophora consocies, with an undergrowth of succulent shrubs, such as Batis maritima and Salicornia perennis and salt-marsh grasses. Where the ground level is low there may be little undergrowth, but typically the dense stand of salt-marsh plants among the pneumatophores of the Avicennia is characteristic. The 'Avicennia-salt-marsh associes' is best developed on land which is not regularly flooded by the tide. The Avicennia trees are not rapidly replaced by natural regeneration and as they die the forest becomes more and more open, with an increase in the salt-marsh vegetation or an invasion of species from the Conocarpus associes which often adjoins the inner edge of the Avicennia zone. If the trees disappear entirely an open salt-marsh or meadow may take the place of the mangrove swamp....The semi-mangrove, Conocarpus erectus,

though not always abundant, is the most characteristic species in [the 'Conocarpus transition associes]; it occupies a zone seldom reached by the tides, immediately behind from the Avicennia associes. Like the Avicennia zone, the Conocarpus associes is an open stand of tress and shrubs with an undergrowth of low-growing salt-marsh plants......On parts of the Florida coast there is a very tall luxuriant mangrove forest [the 'mature mangrove forest association'] in which about 60 percent of the tall trees are Rhizophora and about 30 percent Avicennia.....The main line of...succession appears to be from the 'pioneer Rhizophora family' to the 'mature Rhizophora consocies' and from this through the 'Avicennia-salt-marsh associes' and the 'Conocarpus Transition Associes' to 'hammock forest', the climatic climax of the region....it will be evident that great changes in the environment take place during the course of the succession. Owing to the interaction of the vegetation and its habitat, the ground level rises. In the pioneer stage the vegetation is almost continually under water, but in the later stages the frequency of submergence diminishes till in the Avicennia and Conocarpus stages tidal flooding becomes quite infrequent. Accompanying these changes in the relative level of the land and water there are changes in salinity. The average salinity reaches a maximum in the Avicennia stage and afterwards decreases until it approximates to the value for inland soils. In none of the mangrove communities is salinity constant. It varies most in the Avicennia consocies where the ground and surface water is only occasionally renewed by the tide. Here the salinity may rise to very high levels in dry weather, while after heavy rain it may fall very low. Apart from the remarkable ability of the seedlings to establish themselves under tidal conditions, and the plant's tolerance of prolonged flooding at all stages of its development, the faculty of growing in media of high and often variable salinity is the chief physiological characteristic of mangroves. Yet since Rhizophora and even Avicennia grow naturally where the ground water is apparently perfectly fresh... it may be concluded that at least the American mangroves are salt-tolerant and not salt-demanding, that is to say they are facultative rather than obligate halophytes. This view is supported by a certain amount of experimental evidence. Von Faber (1923; also in Schimper, 1935) disagrees with this view, but the eastern (Old World) mangroves to which he refers are possibly different in this respect....In the Cameroons Rhizophora mangle forms the pioneer community on the seaward fringe and Avicennia grows further inland. Still further from the shore the mangrove passes into a brackish-water community dominated by a species of Pandanus in which palms (Raphia sp., Calamus sp., Phoenix reclinata) are common.....In Malaya the pioneers are not species of Rhizophora, but Avicennia alba and A. intermedia, or sometimes, on deep mud rich in organic matter, Sonneratia griffithii. These pioneer forests establish themselves on shoals or sandbanks out at sea which are exposed at neap tides, or along the seaward edge of existing for-

ests. Avicennia intermedia grows on a comparatively firm clayey substratum which is easy to walk on, A. alba and Sonneratia on softer and blacker mud. On the clay soils the Avicennia is normally succeeded by Bruguiera caryophylloides, but where Sonneratia is the pioneer, Rhizophora mucronata usually follows on...... The Bruguiera caryophylloides type [of mangrove forest]...occurs at a higher level than the preceding and forms a nearly continuous belt behind the Avicennia forest along the west coast of the Malay Peninsula, interrupted only by small stretches where Avicennia forest merges directly into Rhizophora forest. The soil is a firm stiff clay above the reach of the ordinary tides and flooded only during the day or two before and after the spring tides. This type is found chiefly on the sea-face and is usually absent both on shoals and in river forests."

Chapman (1970) discusses the phytogeography of mangroves and points out that the American Rhizophora mangle occurs in the Fijian, Tongan, and New Caledonian islands but not the American species of Avicennia and nowhere between these islands and the Americas. "Unless ocean currents across the Pacific carried the viviparous Rhizophora seedlings from Central America to Fiji they could only have arrived there by the agency of primitive man conveying them. This is not inconceivable since Heyerdahl has argued that voyages did take place between America and Polynesia. In such event, however, one would have expected some of the intervening islands to have received seedlings. It is difficult to accept the viewpoint that originally they occurred there and have since disappeared. The second feature of interest is the absence of the other New World mangrove with viviparous seedlings (Avicennia nitida) from Fiji and Tonga and the intervening islands. If ocean currents were responsible for Rhizophora mangle in these islands there seems no reason why Avicennia nitida should not be there also. This could form an argument in favour of human transport, but this then raises the question why Rhizophora seedlings should have been conveyed and not Avicennia seedlings. The answer could be found in the uses of the two plants by the primitive peoples of Central America. It is possible that the early natives did recognize the value of Rhizophora bark for the purpose of tanning rope, fishing nets and sails and took the seedlings with them on that account. Avicennia has no such useful function and therefore would be left behind. Transport also must have taken place very early before New World speciation had occurred because [the Pacific coast] Rhizophora harrisonii has not yet been recorded from Oceania."

The R. M. King 1550 and A. Gentry s.n. [August 4, 1967], distributed as Avicennia, are actually Laguncularia racemosa Gaertn. f. The genus Aganon Raf., often classified here as a synonym, is apparently neither avicenniaceous nor verbenaceous. Balakrishnan NBK.382, Bembower 72, and Tyson 5384 are also neither avicenniaceous nor verbenaceous. Bontia daphnoides L. is sometimes

distributed in some herbaria as an Avicennia, but it belongs in the Myoporaceae.

Excluded species are:

Avicennia agallocha Puri, Indian Forest Ecol. 232, sphalm. 1960 = Excoecaria agallocha L., Euphorbiaceae

Avicennia latifolia Hornem. ex Moldenke, Phytologia 7: 144, in syn. 1960 = something in the Myrtaceae

Avicennia mucronata Cloudsley & Thompson, Terrest. Environ. 36, sphalm. 1975 = Rhizophora mucronata Lam., Rhizophoraceae

AVICENNIA AFRICANA P. Beauv., Fl. Oware 1: 79—80, pl. 47. 1806.

Additional & emended bibliography: P. Beauv., Fl. Oware 1: 79—80 & 99, pl. 47. 1806; Möller, Denkschr. Wien. Akad. 36: 352. 1876; C. B. Clarke in Hook. f., Fl. Brit. India 4: 604. 1885; Kuntze, Rev. Gen. Pl. 2: 502. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 254. 1893; J. G. Baker in Thiselt.-Dyer, Fl. Trop. Afr. 5: 331--332. 1900; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 48. 1901; Bull. Imp. Inst. Gr. Brit. 11: 417. 1913; deWild., Pl. Bequaert. 2: 123. 1923; Wangerin in Just, Bot. Jahresber. 51 (1): 555 [521]. 1923; Janssonius, Mikrogr. Holz. Jav. 830. 1926; Irvine, Pl. Gold Coast xxviii, xlviii, lxvi, & 44. 1930; A. Chev., Rev. Int. Bot. Appl. Agric. Trop. 11: 1000. 1931; Fedde in Just, Bot. Jahresber. 51 (2): 259. 1933; Dalz., Useful Pl. W. Trop. Afr. 453--454. 1937; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 48. 1941; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 254. 1946; Desousa, Anais Jun. Inv. Col. 3: 52. 1949; Erdtman, Pollen Morph. & Pl. Tax., ed. 1, 448. 1952; Roberty, Pet. Fl. Ouest-Afric. 178. 1954; Aubrev., Fl. For. Cot. Iv., ed. 2, 3: 234, pl. 338. 1959; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 48. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 254. 1960; Hansford, Sydowia Ann. Myc., ser. 2, Beih. 2: 687. 1961; Navalkar, Trop. Ecol. 2: 90. 1961; Gledhill, Check List Flow. Pl. Sierra Leone 30. 1962; Anon., Ind. Bibliogr. Bot. Trop. 1 (1): 40. 1964; Adam, Bull. Inst. Fond. Afr. Noire 27: 133 & 137. 1965; Naurois & Roux, Bull. Inst. Fond. Afr. Noire 27A: 846, 847, & 850--852, fig. 1 & 5. 1965; Compère, Biol. Abstr. 47: 316. 1966; Erdtman, Pollen Morph. & Pl. Tax., ed. 2, 448. 1966; Giglioli & King, Journ. Appl. Ecol. 3: 1—19. 1966; Giglioli & King, Biol. Abstr. 49: 1874. 1966; Berhaut, Fl. Sénégal, ed. 2, 124 & 126. 1967; Hocking, Excerpt. Bot. A.12: 424 & 425. 1967; Jenik, Journ. Linn. Soc. Lond. 60: 25. 1967; Haywood, Geogr. Abstr. B.1968, 1: 27. 1968; Hocking, Excerpt. Bot. A.13: 569 & 570. 1968; Moldenke, Biol. Abstr. 49: 4199. 1968; Moldenke, Phytologia 15: 473 & 474. 1968; Moldenke, Résumé Suppl. 16: 7. 1968; Kohlmeyer, Mycologia 60: 265. 1969; Michel, Naegelé, & Toupet, Bull. Inst. Fond. Afr. Noire A.31: 801 & 802. 1969; Adam, Bull. Inst. Fond. Afr. Noire A.32: 1010 & 1012. 1970; Adam, Journ. Agr. Trop. & Bot. Appl. 17: 265. 1970; V. J. Chapm., Trop. Ecol. 11: 4, 5, & 8, fig. 3. 1970; Gibson, Fieldiana Bot. 24 (9): 177. 1970.

[to be continued]

BOOK REVIEWS

Alma L. Moldenke

"THE ROMANCE OF THE FUNGUS WORLD: An Account of Fungus Life in its Numerous Guises, Both Real and Legendary" by R. T. Rolfe & F. W. Rolfe, xiv & 308 pp., illus., Facsimile Replication for Dover Publications, Inc., New York, N. Y. 10014. 1974. $3.50 paper-bound.

This is a charming book to browse through time and again, to reach for casually, to read at length, to enjoy its 85 illustrations, to study its clear diagrams, to have extra copies for sharing with friends, so it is fortunate that this inexpensive and readily available unabridged replication will replace many times over the few treasured remaining copies of the 1925 original publication in England.

The text considers fungi in mythology, folklore, fiction; then their actual structure, function, modes of existence; on the negative side their personal and economic harmful effects [including poisons] on man; on the positive side fungal use in medicine, industry, foods, the pleasure of mushroom study as a hobby; historical aspects included in their mention by the Ancients; and the very interesting derivation of many fungal names.

In a ruined 1291 chapel at Plaincourault, France, there is a fresco purporting to depict the fall of man. "The Tree of Life is represented as a branching Amanita muscaria, with the serpent twining himself in its 'branches', while Eve, having eaten of the forbidden fruit, appears from her attitude to be in some doubt as to its after effects". The source of this tidbit is given as Bull. Soc. Mycol. Fr. xxvii: 31. 1911. Consistently the authors give sources throughout the text.

Yes, there is much romance to the fungus world.

"THE CHEMICAL BASIS OF LIFE: An Introduction to Molecular and Cell Biology — Readings from SCIENTIFIC AMERICAN" introduced and edited by Philip C. Hanawalt & Robert H. Haynes, ix & 405 pp., illus., W. H. Freeman & Company, San Francisco, California 94104. 1973. $12.00 clothbound, $5.95 paperbound.

This is an enlarged and modernized version of the highly successful "The Molecular Basis of Life" presented in 1968 by the same two leaders in this field. With the growth and refinement of this area wherein biology through its cytology, its genetics, its virology, chemistry, physics (and maybe more) converge, this functional revision offers much more experimental detail, excel-

lent illustrative material in the 376 diagrams, models, charts and electron micrographs (with 231 in color), suggestions for more recent readings for the 17 earlier papers still included, current bibliography and index.

The 38 papers are grouped under four topics introduced by excellent cohesive articles. What wonderfully enriching material this integrated collection of articles offers to both students and teachers!

"ELECTRON MICROSCOPY OF ENZYMES: Principles and Methods" Volume 3 edited by M. A. Hayat, xvi & 175 pp., illus., Van Nostrand Reinhold Company, New York, N. Y. 10001. 1975. $19.50.

Prepared with increasingly greater care than the useful first two volumes in this pioneering series, this third volume contains papers by ten obviously competent workers in this discipline dealing with: (1) nonspecific esterases throughout living tissue where they at least hydrolyze many carboxylic acid esters, (2) purine nucleoside phosphorylase possibly localized in the cytoplasm and seeming to require two substrates for reactions, (3) cellulase of plants and some specific animals, (4) carbonic anhydrase important in acid-base homeostasis and epithelial salt-water transport, (5) creatine phosphokinase in tissues of high energy requirement, and (7) acetyl co-enzyme A carboxylase involved in biosynthesis of long-chain fatty acids.

There are helpful charts, diagrams, outstanding electron-micrographs, bibliography, author and subject indexes. These various new methodologies will need the test of time for evaluation.

"A GARDENER'S GUIDE TO PLANT NAMES" by B. J. Healey, 284 pp., Charles Scribner's Sons, Inc., New York, N. Y. 10017. 1975. $3.95 paperbound.

The author is a professional artist, a skilled gardening enthusiast, and has long made a hobby of studying the meanings and origins of plant names, both common and scientific. He shares with organized care and interest this information for well over a thousand species and varieties in over 400 genera of herbs and small shrubs cultivated in temperate zone gardens. He advocates the use of plant names "in the strange and wonderful language known as Botanical Latin" as much more useful than the assorted, area-limited and variable common names.

In the glossary "tuber" is too loosely defined to include enlarged root as well as enlarged underground stem.

This book first appeared in 1972 in hard cover abroad.

"PESTICIDES: An Auto-Tutorial Approach" by George W. Ware, xv & 191 pp., illus., W. H. Freeman & Co., San Francisco, Calif. 94104. 1975. $5.95 paperbound.

This book is made by offset printing of neat typewritten script and should be helpful to folks interested in qualifying for pesticide applicator and similar certification, who are isolated from other study material and who also need this catechetical approach.

"ORNAMENTAL GRASSES: Decorative Plants for Home and Garden" by Mary Hockenberry Meyer, vii & 136 pp., illus., Charles Scribner's Sons, Inc., New York, N. Y. 10017. 1975. $9.95.

This is an attractive, competently prepared, overpriced, introductory horticultural publication that presents under a hundred grasses (exclusive of the bamboos, but inclusive of a few purportedly grass-like plants such as Liriope muscari, Carex pendula, Acorus gramineus, etc.) for American gardens. Some of these grasses have long been favorites in the British Isles mainly as well groomed specimen plants. To them are added suggestions for water gardens, ground covers, screens, borders and rock gardens and their culture.

The bulk of the text is devoted to landscape descriptions of these ornamentals, some of which are illustrated with recognizable line drawings and mediocre black/white and color photogarphs. There are good suggestions for dried arrangements.

"ANNUAL REVIEW OF PLANT PHYSIOLOGY" Volume 25 edited by Winslow R. Briggs, Paul B. Green & Russell L. Jones, vi & 627 pp., illus., Annual Reviews Inc., Palo Alto, California 94306. 1974. $15.00 U.S. or $15.50 elsewhere; $12.00 & $12.50 for students.

This year's choice of carefully presented and well documented papers include those on: Cell organization re the C_4 syndrome, Phloem transport and uptake mechanisms, Bioenergetics re chloroplasts, Metabolism re N_2 fixation, circadian rhythyms, protein turnovers, aromatics and auxin, Development re tissue cultures, controlled seed germination, plant hormones, isozymes and abscisic acid, Phytotoxins produced by plant parasites, and Physiology of mycorrhiza.

There are separate cumulative indexes for authors and for chapter titles in Volumes 21 to 25 and separate author and a detailed — except for plant names, common or scientific — subject indexes. With all the interdisciplinary research now being conducted, this is a regretted omission.

For all level biology students, teachers, technicians, researchers, field collectors, etc., reading the prefatory chapter entitled "Reflections and Speculations" by F. W. Went can be a

rewarding, thought-provoking experience.

"THOREAU COUNTRY: Photographs and Text Selections from the Works of H. D. Thoreau" by Herbert W. Gleason, edited by Mark Silber, xv & 143 pp., illus., Sierra Club Books, San Francisco, California 94104. 1975. $32.50 clothbound, $9.95 paperbound, both oversize.

How beautiful for both text and duotone photographs in this economy edition! How much more attractive can the de luxe edition be? "Thoreau Country" — Concord, Massachusetts, and its environs — is shown in a fullpage map made by Gleason in 1906 and marked with the localities mentioned by Thoreau in his "Journals".

After an appreciative introduction by Paul Brooks entitled "Thoreau's Joyful Search for Truth" the book is sectioned for the four seasons. Under each are wonderfully descriptive and/or meditative excerpts from Thoreau's writings and well matched photographs selected from the long lost glass slide and negative collection of the Rev. Herbert W. Gleason, who thus recorded his following of Thoreau's trail.

Indexed at the end are the 141 textual sources and the 141 photograph dates and locations. Those whose task it was to make the selections from such rich word and picture source materials must have had a pleasurably satisfying and a concommitantly frustrating experience.

"SCIENCE AND THE EVOLUTION OF PUBLIC POLICY" edited by James A. Shannon, xvii & 259 pp., illus., Rockefeller University Press, New York, N. Y. 10021. 1973. $11.00.

This important, needed analysis consists of a dozen papers carefully considered at a lecture-seminar series supported by the Commonwealth Fund, the National Science Foundation and the Rockefeller University. It considers the following topics: purpose (social) and utility of science, development of scientific knowledge and goals (with concommitant priority problems), the university from the scientific and the technological aspects and their support. Their financial funding started as federal military grants in the physical and biomedical sciences with uneven "excess" spilling over into industrial research and development programs. A more reliable evaluation of scientific interpretation and research (and not exclusively 'federal science') and the concommitant funding of it is what these scientist-administrator-authors advocate.

But the policy setters and purse string holders may not find the actual reading too conducive to continue or to complete: it just does not hold onto one's attention. A pity.

"ALL ABOUT WEEDS" by Edwin Rollin Spencer, xvii & 333 pp., illus., Facsimile Edition for Dover Publications, Inc., New York, N. Y. 10014. 1974. $3.00 paperbound.

In 1940 the first edition of "Just Weeds" appeared. In 1957 the expanded second edition appeared and also entitled "Just Weeds". This new Dover replication of the 1957 edition is dedicated to the memory of the naturalist-educator-author who might not have appreciated the altered title which unfortunately implies too much. The text presents interestingly many of the common weeds of lawn, yard, garden, meadow, pasture, grain and other crop fields, waysides, and waste places in spring, summer, autumn and winter. It describes them well, explains their scientific and common names, reports folklore, medicinal and other uses, their origins, ranges, and control problems. For 102 of them there are accurate, easily recognizable line drawings by Emma Bergdolt.

The book still states that Verbena urticifolia is from Tropical America where it does not even grow. Saponaria officinalis is described as with large rose-colored flowers, but they are typically pale pink — like some roses, of course!

"CACTI and Their Cultivation" by Margaret J. Martin, P. R. Chapman & H. A. Auger, 205 pp., 4 plates, Charles Scribner's Sons, New York, N. Y. 10017. 1975. $4.95 paperbound.

This carefully and enthusiastically prepared guide to cactus raising for the serious horticultural hobbyist first appeared in 1971 in a hardcover edition from Winchester Press. It was then entitled "CACTI & THEIR CULTIVATION" with the first two authors listed in reverse order.

The book is very well illustrated with 93 [unfortunatly unnumbered] black/white photographs. Appropriately the first one contrasts the areoled spiny succulent cactus stem with the never areoled but still spiny succulent euphorb stem. It describes the growing and origin of hundreds of cacti. In the glossary "cleistogamous" is misspelled in an otherwise clean text.

"ANNUAL REVIEW OF PHYTOPATHOLOGY" Volume 13 edited by Kenneth F. Baker, George A. Zentmeyer & Ellis B. Cowling, iii & 412 pp., illus., Annual Reviews, Inc., Palo Alto, California 94306. 1975. $15.00 in U.S., $15.50 elsewhere; $12.00 & $12.50 for students.

As usual, these fine papers have been selected by a rotating editorial committee of the American Phytopathological Society, thus virtually guaranteeing an ever and ever increasing theoretical science basis for understanding of the who, what, where, when and why in all phases of "squirt-gun botany". In the stimulating autobiographical prefatory chapter, "Fungi and Fungicides: The Story of a

Nonconformist", James G. Horsfall relates how this series of papers became the eleventh member of Annual Reviews under his initial editorship.

There are particularly interesting papers on: appressoria in endophytic parasites, predictive systems, host specificity in plant viruses, variation and speciation in Fusarium, meteorological factors in the epidemiology of rice blast, and pathogenesis in nematode-infected plants. In the last-mentioned there is a phenominal set of fine time-lapse micrographs showing Trichodorus similis feeding on a root hair of Nicotiana tabacum, the work of U. Wyss in Film E 2045 at the Institut für den Wissenschaftlichen Film, Göttingen.

"THE NATIVE ORCHIDS OF THE UNITED STATES AND CANADA excluding Florida" by Carlyle A. Luer, 363 pp.. illus., New York Botanical Garden, Bronx, New York 10458. 1975. $40.00 oversize.

"Dedicated to the lovers of orchids throughout the world", this wondrously made and scientifically valuable work is the 1975 companion volume to the well reviewed 1972 [1973] volume on "The Native Orchids of Florida". To acquaint readers and/or browsers of many ages, skills and interests "with this one small vulnerable facet of our magnificent out-door heritage,.....to preserve pictorial records of all our native orchids because of the ever-increasing dangers of their eventual extermination by over-expanding 'civilization' and efforts to 'improve' the land", and to urge amateur orchid enthusiasts to become observers rather than collectors — these the author claims are the major purposes for these books.

"Each genus is treated as a chapter in which all the species are described, discussed and illustrated by [accurate] line drawings made from living plants and by reproductions in color of 35 mm. Kodachrome and Ektachrome transparencies. Without exception each species has been photographed in its native habitat" yielding over 600 exquisite photographs on 97 plates in full color. Detailed geographic distribution maps cover the 146 species and varieties. What a gift to send or to receive!

"PLANNING FOR MAN AND NATURE IN NATIONAL PARKS: Reconciling Perpetuation and Use", by Richard R. Forster, 85 pp., illus., International Union for Conservation of Nature and Natural Resources, Morges, Switzerland. 1973. Paperbound.

This unique, valuable report "sets forth principles and guidelines for preparing management programmes....upon which normal administration and development decisions can be based." It is presented with great concern, skill and convincing accuracy.

PHYTOLOGIA

Designed to expedite botanical publication

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Price of this number $2.00; per volume, $9.50 in advance or $10.25 after close of volume; 75 cents extra to all foreign addresses.

The Variability of the Hawaiian Maile (*Alyxia olivaeformis*), Apocynaceae

Hawaiian Plant Studies 49

by Harold St. John

(Bishop Museum, Honolulu)

The "maile" or Alyxia olivaeformis Gaud. was a favorite native plant of the old time Hawaiians, and it still is to their modern descendants and to the other local Hawaiian residents of whatever race. The flowers are inconspicuous, and the leaves of the vine are rather small, and of ordinary appearance, but the whole plant has a perfume. A fresh and growing plant has a very faint sweet odor, but if the herbage is crushed, the odor soon intensifies and spreads, and is long lasting. The smell is very like that of new-mown hay (containg Anthoxanthum odoratum L.), or like that of the gas phosgene. It was, and is, a Hawaiian tradition at any special gathering to decorate the friends or guests with leis of "maile".

The leis are made by cutting vigorous, straight, young branches of the "maile" and stripping them. If the but end of the cut stem is held in the teeth, then with strong fingernails of the two hands by one long stroke, the epidermis, bark, and all the leaves attached can be stripped from the wooden core. This process bruises the tissue and starts the strengthening of the perfume. The compacted herbage is then pulled out to its original length. It is then pliant and is easily twined into a lei.

An account of this traditional use was given by Neal (1938: 13-14), as follows:

" From a Hawaiian versed in native lore, I learn that the old-timers distinguished five different forms of maile. Maile laulii is fine leaves, maile ha'iwale is brittle, maile launui is large-leaved, maile maluhea is sweet smelling, and maile pakaha has blunt oval leaves. They represent five minor sister goddesses of the hula. Laka, goddess in chief of the hula, was always offered a prayer at the beginning and end of a day's session at the hula school, and as she was believed to be present in her favorite plants — among

them maile, ieie, ti, ohia lehua, ilima — these plants were gathered and placed on her altar in the school hall before classes met. The following is part of an altar prayer to Laka:

Here am I, oh Laka from the mountains,
Oh Laka from the shore
Reside in the wild-twining maile
And the goddess-enwreathing ti.
Thou are Laka,
The god of this altar;
Return, return, abide in the shrine!"

The early botanical explorer Charles Gaudichaud-Beaupré in 1819 collected the "maile" and gave it its scientific name, Alyxia olivaeformis. The plant is a low, straggling vine, but it is not uniform in appearance. It varies mostly in its leaves which are 2, 3, or 4 at a node, and from very narrow to almost round. All botanists who have studied it have agreed that there is but one native species in Hawaii, yet there is a conspicuous variability in the number, size, and shape of the leaves. The Hawaiians have recognized and named several of the varieties. Neal stated that their total was five varieties, three of which had special leaf shapes. People continually bring samples of maile to the Bishop Museum and ask for the scientific names of the several kinds that they have gathered. When told that these kinds are all of one species, they are incredulous and disappointed. They depart dissatisfied. There is some variability due to age or position, and one can sometimes find leaves of more than one shape on a single plant. However, if mature, flowering or fruiting branches are taken, they regularly have leaves of a single characteristic shape. Asa Gray in 1888 described one kind as a variety; and W. Hillebrand in 1888 added two more varieties.

After a review of the problem, a classification has been devised, and it is here presented. Since there are no differences in the flowers or fruits, and since there is variability in the leaf characters, the kinds here described and named are judged to be formae.

Key to Alyxia olivaeformis and its forms

A. Blades elongate lance-linear, less than 7 mm wide, 4.9-5.1 cm long. . . . . . f. linearis.
A. Blades broader,
  B. Blades elliptic,
    C. Blades narrowly elliptic,

D. Blades rounded elliptic,
E. Blades 2½-4-times as long as wide. . . . . f. angusta.
E. Blades 2-times as long as wide. . . . . f. elliptica.
D. blades fusiform elliptic. f. cuneata.
C. Blades broadly elliptic,
F. Blades narrowed at each end,
G. Blades twice as long as wide. . . . . f. olivaeformis.
G. Blades thrice as long as wide. . . . . f. fusiformis.
F. Blades rounded at one or both ends,
H. Blades suborbicular elliptic, 0.8-3 cm. long. . . f. myrtillifolia.
H. Blades narrower,
I. Blade apex subacute. f. subacuta.
I. Blade apex obtuse,
J. Blade base cuneate. f. obovata.
J. Blades broadest near the base,
K. Blades 1.6-5.3 cm long, 11-36 mm. wide. f. rotundata.
K. Blades (4.5-) 5-9 cm long, 19-43 mm wide. f. ampla.
B. Blades broadest near the base,
L. Blades lanceolate. . . . . f. lanceolata.
L. Blades ovate to ovate lanceolate. f. ovata.

Alyxia olivaeformis Gaud., forma olivaeformis, Bot. Voy. Uranie 451, 1829; H. Mann, Am. Acad. Arts Sci. Proc. 7: 197, 1867; Wawra, Flora 57: 365, 1874; Hillebrand, Fl. Haw. Is. 298-299, 1888.

Gynopogon olivaeformis (Gaud.) K. Schum., (as oliviformis), Engler's Nat. Pflanzenfamilien IV, 4(2): 151, fig. 56F, 1895; Heller, Minn. Bot. Stud. 1: 877, 1897; Hochreutiner, Candollea 5: 179, 1932; Degener, Pl. Hawaii Nat. Park 249, pl. 71, 1930.

Hawaiian Name: maile.

Pl. 1, fig. f.

Original Diagnosis: "pedunculis axillaribus solitariis, 2-4-floris; foliis ternis, elliptico-oblongis, utrinque acutis, membranceis; fructibus olivaeformibus."

Expanded Diagnosis of Holotype: Leaves ternate; blades elliptic, twice as long as wide, acute at each end, 3.9-4.3 cm long, 17-18 mm wide.

Expanded Description: Leaves opposite or ternate, 2.6-7 cm long, 10-32 mm wide.

Holotype: Iles Sandwich = (Hawaiian Islands), C. Gaudichaud (P). Type examined.

Kauai: Power Line Trail, L. H. MacDaniels 704; and eight others.

Oahu: Koolau Range, Halawa, St. John 20,382; and fourteen others.

East Maui: Haleakala, Faurie 457.

Hawaii: Manuka, G. W. Russ; and three others.

Forma ampla forma nova.

A. sulcata H. & A., Bot. Beechey Voy. 90, 1832.

Hawaiian Name: maile lau-nui = (large leaved maile).

Pl. 1, fig. 1.

Diagnosis Holotypi: Foliis oppositis, laminis 5-6.3 cm longis 2.3-3.4 cm latis ellipticis apice rotundata.

Diagnosis of Holotype: Leaves opposite; blades 5-6.3 cm long, 2.3-3.4 cm wide, elliptic, the apex rounded.

Expanded Description: Blades (4.5-) 5-9 cm long, 1.9-4.3 cm wide.

Holotypus: Kauai, Hoolulu Valley, Napali Coast, Dec. 5, 1964, S. Carlquist 1,659 (BISH).

Kauai: Wahiawa Bog, B. C. Stone 1,663; and one other.

Oahu: Koolau Range, Palolo-Olympus Trail, D. W. Garber 284.

East Maui: Nahiku, H. L. Lyon.

Hawaii: Glenwood to Olaa, W. M. Giffard 321; and one other.

Forma angusta forma nova.

Pl. 1, fig. b.

Hawaiian Name: Maile lau-liʻi = (small leaved maile).

Diagnosis Holotypi: Foliis oppositis vel ternatis, laminis anguste ellipticis 1.4-2.5 cm longis 5-8 mm latis marginibus revolutis.

Diagnosis of Holotype: Leaves 2-3 at a node; blades narrowly elliptic, 1.4-2.5 cm long, 5-8 mm wide, the margins revolute.

Expanded Descritption: Blades 0.5-4.3 cm long, 5-12 mm wide.

Holotypus: East Maui, Auahi, 3,000 ft alt., Feb. 1953, J. F. Rock 27,000 (BISH).

Oahu: Koolau Range, W. Hillebrand & J. M. Lydgate; and one other.

Waianae Mrs.: Puu Kumakalii, F. R. Fosberg 13,649.
Molokai: Makalelau, C. N. Forbes 125.Mo.; and one other.
East Maui:Auwahi, L. W. Bryan; and one other.
West Maui: Olowalu Valley, Forbes 2,288a.M.

Forma cuneata, forma nova
Pl. 1, fig. d.

Diagnosis Holotypi: Foliis oppositis, laminis 2.2-5.5 cm longis 8-13 mm latis anguste ellipticis basi cuneata.

Diagnosis of Holotype: Leaves opposite; blades 2.2-5.5 cm long, 8-15 mm wide, narrowly elliptic, cuneate at base.

Expanded Description: Blades 2.2-6.5 cm long, 8-26 mm wide.

Holotypus: Oahu, Waianae Mts., Puu Hapapa, 1,800 ft. alt., G. Spence 44. (BISH).

Kauai: Kokee, A. M. Alexander & L. Kellogg 5,247.

Oahu: Koolau Range, Aiea Trail, M. Kerr; and four others.

Waianae Mts., Kamananui, 1,500 ft. alt., B. C. Stone 889; and two others.

Molokai: Manawai-Kahananui ridge, 600 m alt., F. R. Fosberg 13,388; and two others.

East Maui: Auwahi, C. N. Forbes 1,978.M.; and one other.

A plant of this forma, with blades partly white, mostly with white margins, or one half white, or with a broad white longitudinal stripe, and the drupes with white stripes, was collected above Kunia, Waianae Mts., 3,000 ft. alt., Oct. 5, 1974, by Walter Pomroy. This is, of course, a freak, but it is the sort of mutant that is sought by horticulturists.

Forma elliptica forma nova.
Pl. 1, fig. i.

Diagnosis Holotypi: Foliis oppositis, laminis 1.2-3.2 cm longis 8-13 mm latis.

Diagnosis of Holotype: Leaves opposite; blades 1.2-3.2 cm long, 8-15 mm wide.

Holotypus: West Maui, Olowalu Valley, lateral ridge, May 16, 1920, C. N. Forbes 2,388b.M. (BISH).

Kauai, Alakai Swamp, B. C. Stone 1,544; and one other.
Oahu: Kawailoa, Forbes 2,091.O; and one other.
East Maui: Ulupalakua, G. C. Munro; and one other.
Lanai: W. Hillebrand & J. M. Lydgate.

Forma *fusiformis* forma nova
Pl. 1, fig. h.

Diagnosis Holotypi: Foliis oppositis vel ternatis, laminis ellipticis vel oblanceolatis, triplo longioribus quam lateralibus, 3-6 cm longis 14-28 mm latis basi cuneata.

Diagnosis of Holotype: Leaves opposite or ternate; blades elliptic to oblanceolate, thrice as long as wide, 3-6 cm long, 14-28 mm wide, the base cuneate.

Expanded Description: Blades 2.5-8.5 cm long, 11-32 mm wide.

Holotypus: Hawaii Island, Puna, July 7, 1915, *Forbes & Thurston 1,045.H*. (BISH).

Kauai, Kokee, *St. John et al. 10,694*; and one other.

Oahu: Koolau Range, Wailupe, *D. W. Garber 181*; and five others.

Waianae Mts., Makua, *St. John 17,663*.

East Maui: Nahiku, *H. L. Lyon*.

Hawaii: Kilauea, *F. R. Fosberg 33,276*; and five others.

Forma *lanceolata* (Hbd.) comb. nov.
A. olivaeformis Gaud., var. *lanceolata* Hbd., Fl. Haw. Is. 299, 1888.
Pl. 1, fig. e.

Original Diagnosis: "Leaves ovate-lanceolate, acute, often emarginate at the base, binate, ternate or quarternate, 1½-1 3/4′ × 6-8‴. Peduncles umbellately 3-5-flowered. Lobes of corolla ½ the length of the short tube. Drupes oblong, 6-7″, obtuse at both ends."

Expanded Description: Blades 2-5 cm long, 10-22 mm wide.

Holotype: West Maui, Kaanapali, woods, *W. Hillebrand* (B). Type destroyed. Isotype (BISH).

Kauai, Waininiua trail, 3,500 ft alt., *A. K. Chock 900*.

Oahu: S. Opaeula Gulch, Koolau Mts., 500 m alt., *F. R. Fosberg 8,847*; and nine others.

Waianae Mts.: eight others.

Molokai: Mts., above Puu Kolekole, *C. N. Forbes 201.Mo*.

West Maui: mauka of McGregor, *O. Degener et al. 22,073*.

Forma *linearis* forma nova
Pl. 1, fig. a.

Diagnosis Holotypi: Laminis lancei-linearibus 3-6

cm longis 5-7 (-9) mm latis ambitu acutis.

Diagnosis of Holotype: Blades lance-linear, 3-6 cm long, 5-7 (-9) mm wide, acute at each end.

Holotypus: Oahu, Koolau Range, Palolo, Kaau-Waiomao Ridge, 1,800 ft alt., Dec. 5, 1943, H. St. John 20,370 (BISH).

Oahu: U. S. Exploring (Wilkes) Expedition, (the part with the elongate leaves), (US).

Forma myrtillifolia (Gray ex Hbd.) comb nov.

A. olivaeformis Gaud., var. myrtillifolia Gray ex Hbd., Fl. Haw. Is. 299, 1888.

A. myrtillifolia (Gray ex Hbd.) Lévl., Fedde Repert. 10: 155, 1911.

Pl. 1, fig. g.

Original Diagnosis: "Leaves in whorls of 3 and 4; small oblong or obovate, 4-9‴ × 2-4‴, obtuse at both ends or contracted at the base, sometimes orbicular. Peduncle umbellately 4-5-flowered. Calyx and corolla mostly 5-lobed. Drupe short ovoid, 4-6‴."

Expanded Description: Leaves in whorls of 3-4 or opposite; blades broadly elliptic, 0.8-3 cm long, 5-15 mm wide.

Specimens Cited: "Lanai! E. and W. Maui!"

Lectotype: W. Maui, Waikapu, W. Hillebrand (B). Isotype (BISH).

Kauai: Alakai Swamp Trail, M. R. Crosby & W. R. Anderson 1,991.

East Maui: s. slope Haleakala, C. N. Forbes 2,123.M; and two others.

Lanai: Poomai, G. C. Munro 91; and three others.

Hawaii: Kanehaha, Kona, Forbes 250.H.

Forma obovata forma nova

Pl. 1, fig. f.

Diagnosis Holotypi: Foliis oppositis vel ternatis, laminis 2.1-3.5 cm longis 14-24 mm latis.

Diagnosis of Holotype: Leaves opposite or ternate; blades obovate, 2.1-3.5 cm long, 14-24 mm wide.

Holotypus: Hawaii Island, kipuka in Flow of 1855, June 7, 1915, C. N. Forbes 749.H. (BISH).

Forma ovata (Hbd.) comb. nov.

Pl. 1, fig. n.

A. olivaeformis Gaud., β var. ovata Hbd., Fl. Haw. Is. 299, 1888.

Original Diagnosis: "Leaves mostly opposite,

rarely ternate, broadly ovate or rhomboidal and mostly obtuse, 1¼ - 2′ × 3/4 - 1¼′. Drupes ovoid or obovoid, about 6″ long. - A. sulcata Hook. & Arn."

Revised Diagnosis: Blades ovate, but narrowed to the apex.

Holotypus;Hawaiian Islands, Oahu Island, "on both ranges." [Hillebrand], (B). Type destroyed. Isotype (BISH). Isotype examined.

Kauai: Halemanu, D. Herbst 1,028; and one other.

Oahu: Koolau Range, Kipapa Gulch, St. John 11,678; and eleven others.

Waianae Mts.: Mt. Kalena, M. L. Grant 7,436.

Molokai: Halawa, Forbes 482.Mo.

East Maui: Kipahulu, St. John & R. J. Catto 17,802.

West Maui: Puu Kukui, M. R. Crosby & W. R. Anderson 1,870; and one other.

Hawaii: Waiakea to Olaa, Forbes 566.H; and one other.

Forma *rotundata* forma nova

Hawaiian Name: maile pākāha = (greedy maile).

Pl. 1, fig. k.

Diagnosis Holotypi: Laminis late ellipticis obtusis 1.6-3.6 cm longis 12-23 mm latis.

Diagnosis of Holotype: Blades broadly elliptic, obtuse, 1.6-3.8 cm long, 12-23 mm wide.

Expanded Description: Blades 1.6-5.3 cm long, 11-36 mm wide.

Holotypus: Oahu, Koolau Range, Pupukea Trail, in trees, 1,400 ft alt., 26 June 1964, M. R. Crosby & W. R. Anderson 1,567 (BISH).

Kauai: Kaholuamanoa, A. A. Heller 2,344; and five others.

Oahu: Koolau Range, Lanihuli summit, E. H. Bryan Jr.; and six others.

West Maui: Olowalu, C. N. Forbes 2,385.M.

Lanai: Mahana, G. C. Munro 59; and one other.

Though he accepted only the species (as Gynopogon olivaeformis (Gaud.) Heller), Degener (1930: pl. 71) gave a detailed drawing of a specimen from Hawaii which seems to represent our forma rotundata. Although no specimens of this forma from the island of Hawaii have been examined, it may well occur there, as it is presently known on the islands of Kauai, Oahu, Maui, and Lanai.

Forma *subacuta* forma nova

Pl. 1, fig. m.

Diagnosis Holotypi: Foliis ternatis, laminis late ellipticis subacutis 2.7-4.3 cm longis 18-30 mm latis.

Diagnosis of Holotype: Leaves ternate; blades broadly elliptic, but subacute, 2.7-4.3 cm long, 18-30 mm wide.

Expanded Description: Leaves ternate to opposite, 2-5.4 cm long, 12-30 mm wide.

Holotypus: Island of Hawaii, Kiipu, June 26, 1915, C. N. Forbes 940.H. (BISH).

Kauai: Mts. above Ka Loko Reservoir, Forbes 521.K.

Oahu: Koolau Range, Waialae-iki, 1,800 ft alt., B. C. Stone 1,205-A; and ten others.

Waianae Mts., Piko Trail, Mokuleia, R. J. Baker; and two others.

Lanai: Puu Aalii, 900 m alt., F. R. Fosberg 12,513; and six others.

Hawaii: Kipuka Puaulu, J. F. Rock 12,589; and four others.

All the specimens cited in this study are in the Bishop Museum, Honolulu, unless otherwise indicated.

Bibliography

Degener, Otto, 1930. Ferns and Flowering Plants of Hawaii National Park, 1-312, pl. 1-95, figs. 1-45.

Neal, Marie C., 1938. Maile. Paradise of the Pacific 5(20): 13-14, ill., February.

Legend

Plate 1, Formae of Alyxia olivaeformis Gaud., from the holotypies. a, forma linearis; b, c, forma angusta; d, forma cuneata; e, forma lanceolata; f, forma olivaeformis; g, forma myrtillifolia; h, forma fusiformis; i, forma elliptica; j, forma obovata; k, forma rotundata; l, forma ampla; m, forma subacuta; n, forma ovata.

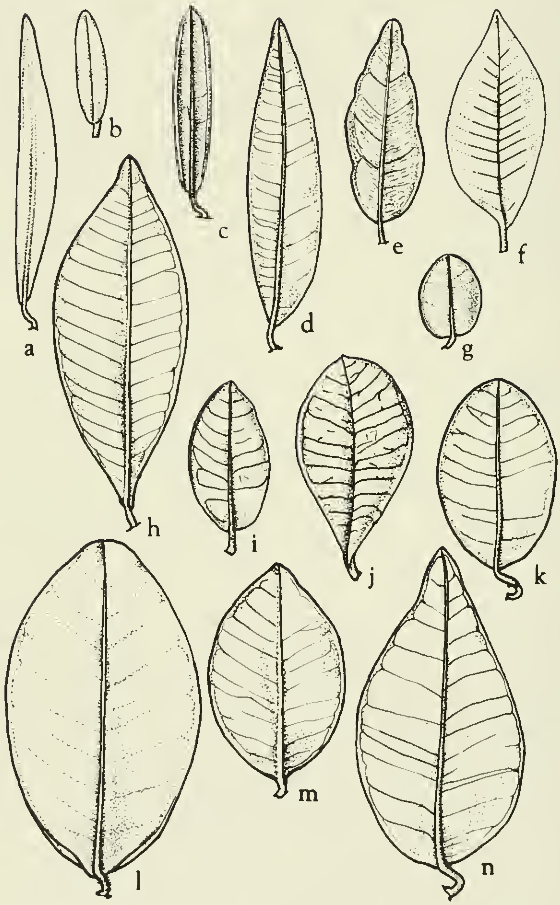

Plate 1
Variability of Alyxia olivaeformis

NOTES ON THE GENUS *MATELEA* (APOCYNACEAE *S.L.*)

Warren Douglas Stevens
Michigan State University, East Lansing, Michigan 48824

While preparing a revision of *Matelea* subgenus *Dictyanthus*, I included in my studies three species which I now exclude from this subgenus. It seems more appropriate to publish the treatments of these three species here than as part of the revision of the subgenus. One of the species is described as new and one is provided with a new combination. Notes concerning two species of *Matelea* more distantly related to subgenus *Dictyanthus* are also provided.

In referring to the descriptions given here, it will be helpful to make note of certain usages of terminology.

(1) The description of the indumentum has been simplified and, to a certain extent, generalized by the convention of referring to all trichomes as either *short*, *glandular*, or *long* and modifying these terms as appropriate. These trichomes are all uniseriate and multicellular and can have straight or uncinate tips. Short trichomes are less than 0.1 mm long, typically about 0.05 mm. Glandular trichomes are the same length to slightly shorter than the short trichomes and have a short stalk, an inflated middle, and a short apiculum. The inflated part typically collapses on drying, giving these the appearance of capitate glandular trichomes. Long trichomes are more than 0.1 mm long, typically much more.

(2) The leaves are described essentially according to Hickey (1973). This terminology is likewise employed to describe the shape of the bracts, calyx lobes, and corolla lobe apices. The leaf length has been considered to be the length of the midrib and the leaves are described on the basis of the largest leaf of each specimen examined.

(3) I have considered the corolla lobes to be distinct from the limb. The corolla, then, is composed of the tube, the limb, and the lobes.

(4) Measurements of the pollinia are taken in the normal orientation they assume when removed. The length of the pollen sac is taken from the point of attachment of the corpusculum to the tip, including, therefore, the translator arm or caudicle.

MATELEA SEPICOLA W. D. Stevens, sp. nov. Type: *Stevens 1436* (MSC, holotype).

Matelea sepicola W. D. Stevens; species insignis corolla parva urceolata (2.5-4.5 mm e basi ad sinum) habenti paginam interiorem glabram et lineas parallelas verticales intra tubum et lobis coronarum crasse laminaribus rhombeis (in aspectu

laterali) unusquisque adnato corollae secus medium paginae dorsalis et gynostegio a septo tenui adaxiali dignoscenda.

Plants twining vines. Stems essentially herbaceous and lacking bark except with a woody caudex with thick corky bark, with dense short and glandular trichomes and moderately dense to dense, mostly straight long trichomes to 3 mm long. Leaf blade wide-ovate or occasionally ovate or very-wide-ovate, 35-85 (-105) mm long, 23-85 mm wide, indumentum of dense, or occasionally sparse above, uncinate long trichomes, surface pusticulate to minutely pusticulate or occasionally nearly smooth, smaller veins often slightly to sharply raised below, apex acuminate to attenuate, base lobate, lobes convergent to divergent, with 0-3 (-5) acropetiolar glands, margin often slightly thickened and revolute; petiole (19-) 28-72 (-88) mm long, with dense short and glandular trichomes and sparse to dense, mostly uncinate long trichomes. Inflorescence a simple, or more often a compound, condensed, helicoid cyme; primary peduncle mostly 2-4 mm long, but occasionally with an inflorescence branch originating at or near the base of the apparent peduncle (Figure 2B), with dense short and glandular trichomes and moderately dense to very sparse or even absent, straight or uncinate long trichomes; bracts linear to lorate or lanceolate, 1-2 mm long, abaxial surface with dense short and glandular trichomes and moderately dense to dense, straight or uncinate long trichomes, adaxial surface glabrous; pedicel 1.5-3.5 mm long, with indumentum of peduncle. Calyx lobes narrow-ovate, 3-5 mm long, 1.5-2.5 mm wide, apex attenuate, with one gland below each sinus, abaxial surface with sparse to moderately dense uncinate long trichomes, adaxial surface glabrous. Corolla urceolate, base to sinus length 3-5 mm, limb slightly reflexed and slightly revolute; lobes 2.5-4.5 mm long, apex acute to obtuse, slightly reflexed and slightly revolute; glabrous within, indumentum outside of moderately dense straight long trichomes on limb and lobes; tube with a pair of ridges inside opposite each corona lobe; with reddish-brown vertical lines within tube, these becoming circular and reticulated on limb and lobes but partially obscured by the green or greenish-brown background. Corona lobes 1.5-3.0 mm long, shape elaborate but basically thickly laminar and rhombic in lateral view, adnate or tightly connivent along axis to corolla (between ridges) for part of length but tip free above, adnate to gynostegium along axis by a narrow wall, loosely to tightly appressed side to side, lateral tips sometimes slightly thickened, giving a trilobed appearance from above. Gynostegium 1.5-3.0 mm high and 1.5-2.0 mm wide at apex, slightly stipitate, apex broadly and shallowly concave and slightly convex and bilobed in center, corpuscula slightly exceeding convex center, terminal anther appendages covering nearly half of apex. Corpusculum sagittate, 0.20-0.25 mm long, 0.08-0.09 mm wide, pollen sacs obliquely obovate, 0.62-0.72 mm long, 0.34-0.43 mm wide. Follicles fusiform, (44-) 54-74 mm long, 12-20 mm wide, green with white stripes, with dense short trichomes and occasionally very sparse glandular trichomes, with 22-

37 (-48) projections, these thick, straight or arcuate, to 4 mm long. Mature seeds unknown, immature seeds obovate, to 4 mm long, to 3 mm wide, irregularly toothed distally, both sides verrucate to rugose, dark brown; coma to 30 mm long, white. Figures 1 and 2.

The six known collection localities range from southern Sinaloa through Nayarit to Jalisco. Figure 3. The four localities in Nayarit and Sinaloa are apparently at elevations of 30 m or less and the two in Jalisco at about 1300 m. Flowering August-October. Mature-sized fruit collected in September and November and old dehised fruit collected in June and September. The known habitats are fencerows, roadsides, and thickets, hence the origin of the epithet.

Woodson recognized this as an undescribed species by his undated annotation "Matelea (Macroscepis) n. sp." on *Ferris 5506* at DS, but annotated another collection, *Pringle 5439* at F, as *Matelea reticulata* (Engelmann) Woodson, probably because the label determination was "Gonolobus reticulatus, Engelm., (with short peduncles)." *Matelea reticulata* is quite a different species both in morphology (Woodson [1941] placed it in his subgenus "Eumatelea") and in range, being found in northeastern Mexico and adjacent United States. As certainly as this species is distinct from *Matelea reticulata*, it also does not belong to the subgenus *Macroscepis*, even as Woodson conceived it. The six species Woodson referred to subgenus *Macroscepis* form a highly unnatural assemblage, of which the type element probably deserves generic status. There are at least two other distinct groups represented in the subgenus, but all the other species are probably appropriately placed in the genus *Matelea*. *Matelea sepicola* appears to have closer affinities with subgenus *Dictyanthus* than with any species Woodson included in subgenus *Macroscepis*. Despite the differences in corolla shape, urceolate rather than campanulate, and the proportionately broader corona lobes, the flowers are much like those of subgenus *Dictyanthus*, especially with respect to the position and mode of adnation of the corona lobes. The vegetative features, including the indumentum, and the nature of the fruit are identical with those of the subgenus *Dictyanthus* and distinct from most of the rest of *Matelea*. Until *Matelea* is better studied, however, I prefer not to assign this species to any of Woodson's subgenera.

SPECIMENS EXAMINED. *MEXICO*. SINALOA: ca 2.0 mi SW of Hwy 15 along rd to Chametla, ca 5 mi S of Rosario, 10 Sep 1973 (fl & fr), *Stevens 2038* (MSC). NAYARIT: vicinity of San Blas, first hill on old Spanish rd to Tepic, 13 Oct 1925 (fl), *Ferris 5506* (DS, US); Tuxpan, Palapar Redondo [labelled as State of Jalisco], 20 m, 6 Nov 1926 (fr), *Mexia 1060* (UC); Acaponeta, 23-30 June 1897 (fr), *Rose 3122* (US). JALISCO: hills near Tequila, 26 Sep 1893 (fl & fr), *Pringle 5439* (F, MO, US); ca 6.9 mi SW of Hwy 15 along rd to Ameca, near dirt rd leading N, 23 Aug 1971 (fl), *Stevens 1436*,

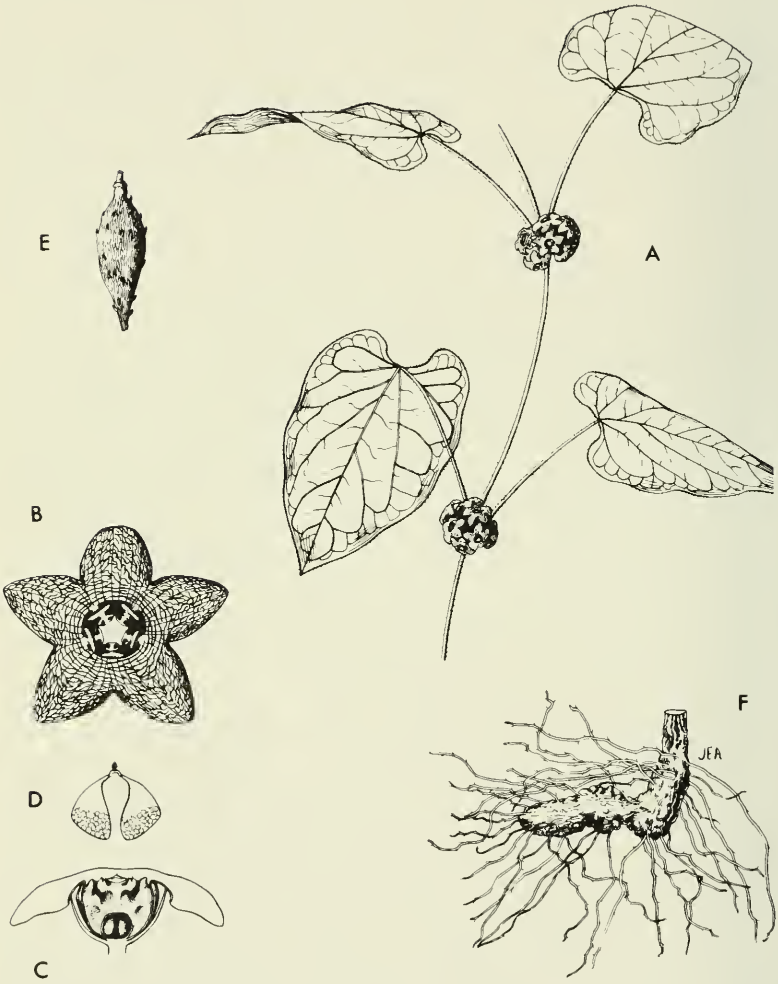

Figure 1. *Matelea sepicola* (drawn from *Stevens 1436*). A. section of flowering stem, x 0.4; B-C. flowers, x 2.3; D. pollinium, x 16; E. fruit, x 0.4; F. caudex, x 0.4.

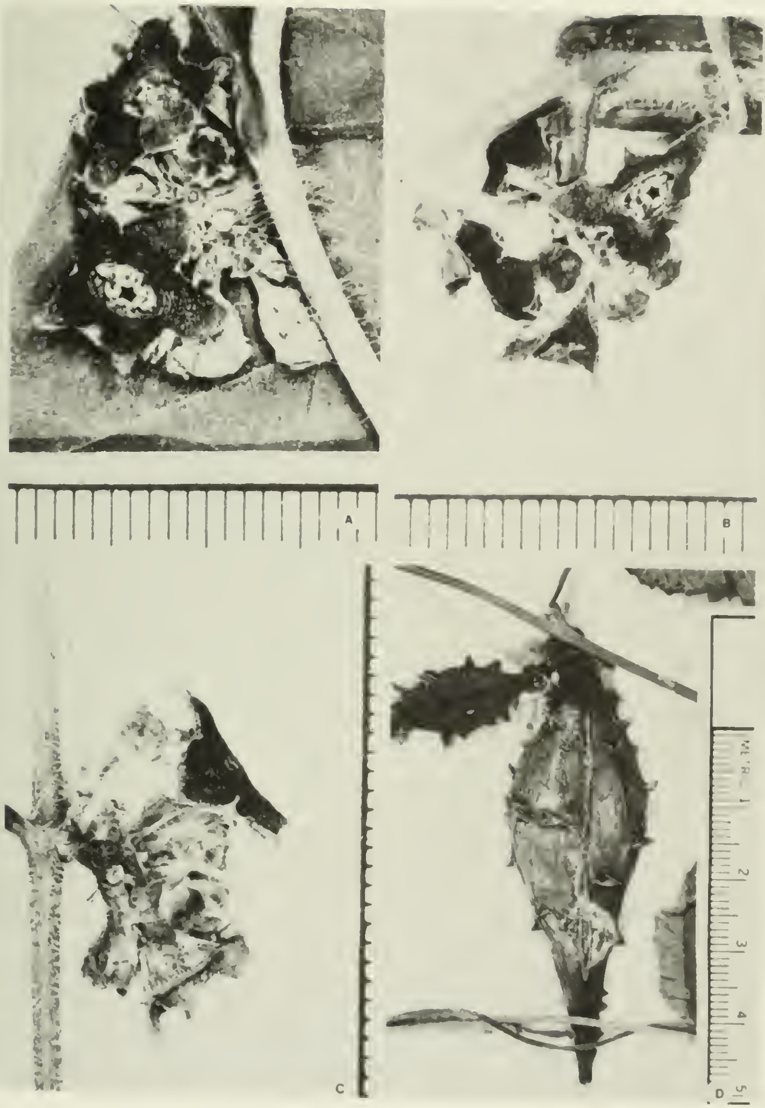

Figure 2. *Matelea sepicola*. A. inflorescence, note parallel lines within corolla, *Stevens 1436*; B. inflorescence, note shape and method of adnation of corona lobes, *Stevens 1436*; C. inflorescence, one petiole removed, note inflorescence branch originating near base of apparent peduncle, *Stevens 1895*; immature fruit, *Pringle 5439* (F).

type of *Matelea sepicola* (MSC), 2 Sep 1973 (fl), *Stevens 1895* (MSC).

Matelea altatensis (Brandegee) Woodson, Ann. Missouri Bot. Gard. 28: 236. 1941.
Gonolobus altatensis Brandegee, Zoe 5: 244. 1908. Type: *Brandegee s.n.*, 10 Sep 1904 (UC! holotype; MO, 2 specimens, fragments of holotype!).

Plants twining vines. Stems woody below, with thin to thick corky bark, sometimes with a weakly developed woody caudex with thick corky bark, herbaceous and lacking bark above, with sparse to dense short, glandular, and long trichomes, long trichomes to 3 mm long and mostly straight. Leaf blade wide-ovate or rarely very-wide-ovate, (35-) 45-75 (-87) mm long, (25-) 35-77 mm wide, with sparse glandular trichomes and sparse to occasionally dense, mostly uncinate long trichomes, surface pusticulate, especially above, apex acute to attenuate, base lobate, lobes mostly convergent, with (0-) 2-5 acropetiolar glands, margin occasionally somewhat thickened and revolute; petiole 25-52 mm long, with sparse to dense short, glandular, and long trichomes, long trichomes mostly uncinate. Inflorescence a simple, or more often a compound, condensed, helicoid cyme; primary peduncle (15-) 30-135 mm long, with sparse to dense short, glandular, and long trichomes, long trichromes straight or uncinate; bracts linear to lanceolate, 1.5-4.0 mm long, with indumentum of leaves; pedicel (6-) 12-28 mm long, with indumentum of peduncle. Calyx lobes lanceolate to ovate or occasionally elliptic, (2-) 4-6 mm long, 1.5-2.5 mm wide, apex acute to attenuate, with one gland below each sinus, abaxial surface with sparse glandular trichomes and sparse to dense, mostly uncinate long trichomes, adaxial surface glabrous or with scattered glandular trichomes. Corolla shallowly campanulate, nearly rotate, base to sinus length 4-6 mm, limb not distinct, margins slightly or not at all revolute; lobes (2-) 4-7 mm long, apex acute to obtuse or rounded, slightly reflexed, margins slightly revolute; indumentum within of dense short trichomes except glabrous between corona lobes and especially dense around corona lobes and in a line above them, indumentum on outside of glandular and straight long trichomes, occasionally distal half of lobes nearly glabrous; tube convoluted with the raised parts opposite the corona lobes, forming shallow pockets between them, with the corona lobes in distinct pockets in the base of the raised parts; pale greenish-white or sometimes also tinted yellowish, especially at base, with very faint to moderately dark green reticulations, mostly drying pale brown. Corona lobes ca 2 mm long, basically triangular in outline above, appressed side to side, adnate to gynostegium and adherent but not adnate to corolla. Gynostegium ca 2 mm high and ca 2 mm wide at apex, not markedly stipitate, apex flat or slightly convex, with a low ridge from each corpusculum to center, this formed from adjacent margins of terminal anther appendages which nearly

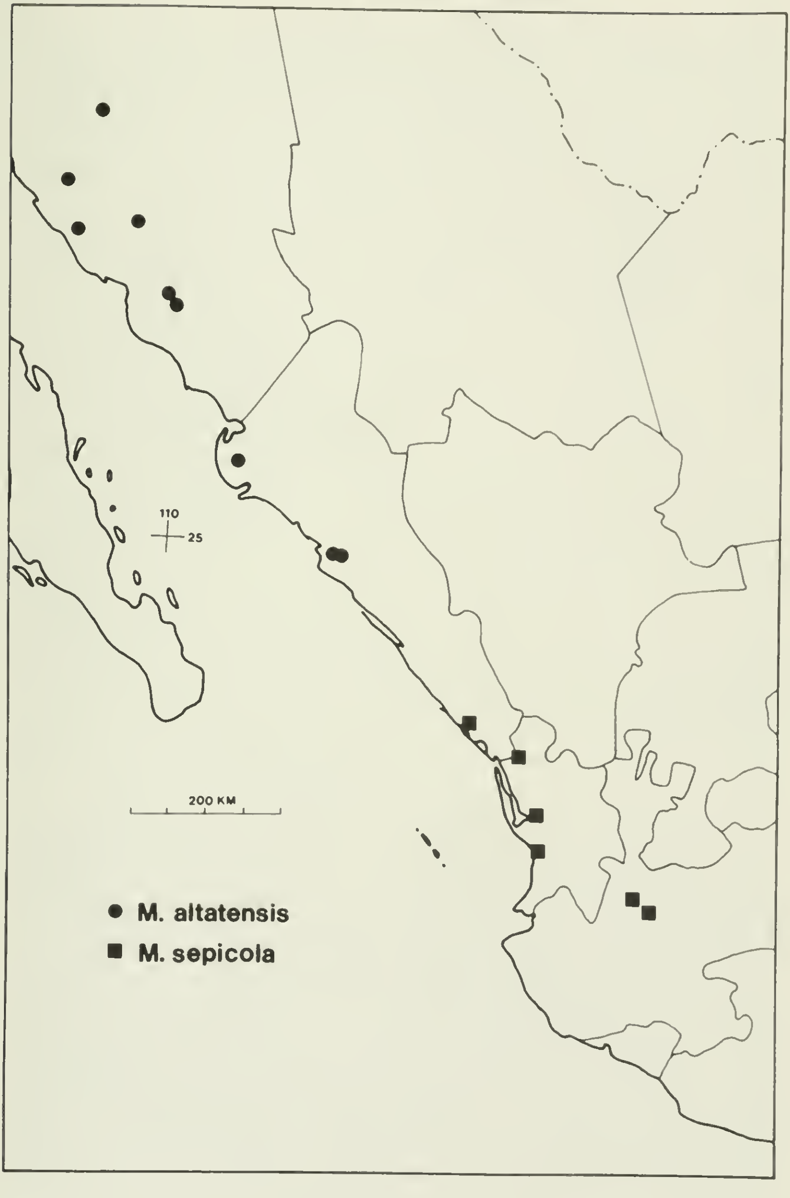

Figure 3.

or completely cover apex. Corpusculum sagittate, 0.20-0.26 mm long, 0.15-0.18 mm wide, pollen sacs obliquely obovate, 0.78-0.88 mm long, 0.28-0.35 mm wide. Follicles fusiform, with a distinct basal flange on one side and apex often long and thin, 60-100 mm long, 13-20 mm wide, striped and mottled light and dark green, glabrous or with sparse short trichomes, with 18-34 (-44) arcuate to hooked projections to 8 mm long. Seeds obovate, 4-5 mm long, ca 2 mm wide, with a raised margin, this coarsely toothed, especially distally, inside this margin slightly convex and sparsely verrucate on one side, the other side slightly concave, verrucate, and with a narrow ridge from apex to near center, dark brown; coma ca 35 mm long, white. Figure 4.

Matelea altatensis has been collected from northern Sonora to central Sinaloa, but is to be expected farther south, southern Sinaloa being rather poorly collected. Figure 3. Most of the collections have been on the coastal plain at elevations of less than 50 m, but the northernmost localities are more inland and apparently up to about 500 m. This species is found in dry thorn forests in heavy clay soils or occasionally in sandy washes. Flowering specimens have been collected from late July to mid-September and the two collections with nearly mature fruit were made in September and the one specimen with completely mature fruit was made in February.

Only two of the 12 collections of this species have been made since the 1940's and it is probably not at all common. Particularly with the increased development of irrigation systems, the coastal plains of this part of Mexico are rapidly being cleared for agricultural purposes, especially for growing cotton. Suitable habitats for *Matelea altatensis* are already difficult to find near highways.

Although Woodson (1941) included this species in his subgenus *Dictyanthus*, it lacks the major character that has been used to distinguish this group, the adnation of the digitate corona lobes to the corolla. The corona lobes of this species (in shape, size, and position) are much like those of *Matelea tuberosa* and *M. hemsleyana*, but in these species the corona lobes are adnate for their full length to the corolla. The corona lobes of *M. altatensis* are appressed to or perhaps even connivent with the corolla and it may be a small step to complete the adnation. Three other characters can more readily be used to distinguish this species from subgenus *Dictyanthus*. 1) This is the only species either included in or closely related to the subgenus in which the terminal anther appendages essentially cover the style apex. In dried flowers these appendages often shrink somewhat, leaving an uncovered spot in the center of the style apex, but because of the drying, become bright white and easily observable (Figure 4D). In fresh flowers the appendages are translucent and more difficult to see. 2) Also unique is the distinct basal

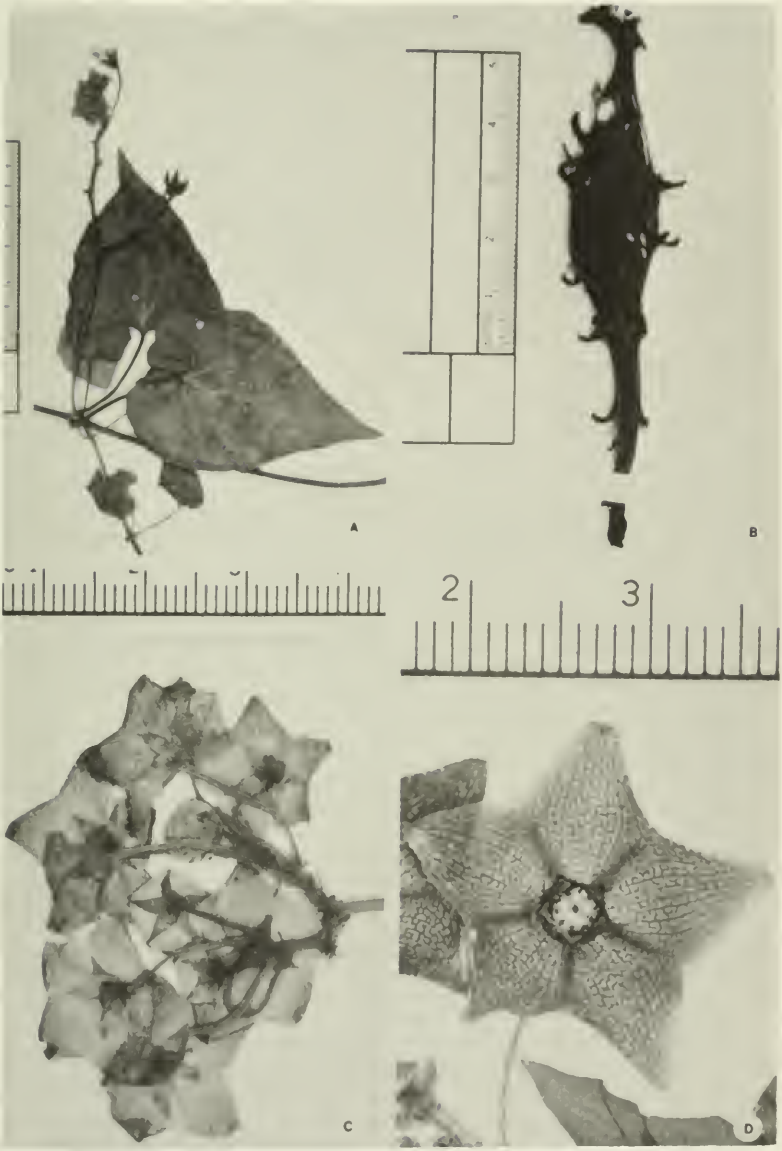

Figure 4. *Matelea altatensis*. A. old inflorescence, *Stevens 2062*; B. fruit, *Wiggins & Rollins 259* (MO); C. inflorescence, *Wiggins & Rollins 140* (ARIZ); D. flower, *Wiggins & Rollins 140* (A).

flange on one side of the follicle (Figure 4B). 3) This species differs from those I have included in subgenus *Dictyanthus*, but compares with a few species closely related to the subgenus in having an inflorescence which is, or at least can become, a compound rather than a simple cyme. Again I prefer not to assign this species to any of the existing subgenera.

Within the geographic range of *Matelea altatensis*, there are two somewhat more distantly related species of *Matelea* which could be confused with it in fruiting condition. *Matelea pringlei*, which may actually be restricted to Baja California, differs in having longer, thinner, and straight rather than arcuate projections and lacks a basal flange. *Matelea caudata* differs in having shorter and thicker follicles and again lacks the basal flange. *Matelea caudata* also tends to be shrubby rather than viney.

SPECIMENS EXAMINED. *MEXICO*. SONORA: Torres, 6 Feb 1903 (fr), *Coville 1627* (US); 0.2 mi N of Km marker 2231 and ca 0.2 mi N of side rd to Querobabi, Hwy 15, 28 July 1969 (fl), *Mason 2895* (ARIZ, CAS, NY); Bacum Station, near Río Yaqui, 30-40 m, 7 Sep 1935 (fl), *Pennell 20207* (GH, MICH, NY, PH, US); ca 2.2 mi NE of Hwy 15, ca 6.9 mi SE of Ciudad Obregon, 12 Sep 1973 (fl & fr), *Stevens 2062* (MSC); 27 mi W of Hermosillo on rd to Kino Bay, 720 ft, 28 Aug 1941 (fl), *Wiggins & Rollins 140* (A, ARIZ, DS, MO, ND, NY, TEX, UC, US); 5 mi N of Suhuoral, 18 mi W of El Camino Nacional (Hermosillo-Guaymas), 3 Sep 1941 (fl & fr), *Wiggins & Rollins 259* (A, ARIZ, DS, MO, 2 specimens, ND, NY, UC, US). SINALOA: vicinity of Culiacan, Yerba Buena, 10 Sep 1904 (fl), *Brandegee s.n.*, type of *Gonolobus altatensis* (MO, 2 specimens, fragments of UC specimen, UC); Culiacan, 17 Sep 1904 (fl), *Brandegee s.n.* (POM); Culiacan and vicinity, volcanic cerro and valley, 150-500 ft, Sep 1944 (fl), *Gentry 7065* (GH); Maraton, 12 mi W of Culiacan, 100 ft, 21 Sep 1944 (fl), *Gentry 7086* (GH, MICH, NY); Los Mochis, July 1912 (fl), *Tays s.n.* (US). STATE UNKNOWN: without locality and date (fl), *Sessé, Mociño, et al. 1301* (F, fragment, MA, not seen, photo from F neg. 41451 at MSC), *3570* (F, fragment, MA, not seen, photo from F neg. 41452 at MSC).

MATELEA ASPERA (Miller) W. D. Stevens, comb. nov.

Cynanchum asperum Miller, Gard. Dict., ed. 8, no. 6. 1768. Type: *Houstoun s.n.* (BM, not seen, holotype, photos from BH neg. 5251 at MICH! & US!).

Gonolobus littoralis Decaisne *in* deCandolle, Prodr. 8: 596. 1844. Type: *Galeotti 1545* (P! holotype; G! isotype; F, fragment of G isotype! photo from F neg. 26924 of G isotype at MO!).

Vincetoxicum littorale (Decaisne *in* deCandolle) Standley, Contr. U.S. Natl. Herb. 23: 1188. 1924.

Vincetoxicum megacarphum Brandegee, Univ. Calif. Publ. Bot. 4: 381. 1913. Type: *Purpus 6014* (UC! holotype; F! G, 2

specimens, 1 a fragment of F specimen! GH! MO, 3 specimens, 2 are fragments, probably of UC specimen! NY! P! isotypes).

Matelea megacarpha (Brandegee) Woodson, Ann. Missouri Bot. Gard. 28: 236. 1941.

Pachystelma cordatum Brandegee, Univ. Calif. Publ. Bot. 7: 330. 1920. Lectotype: *Purpus 8508* [UC no. 204968, not *Purpus 8008* of protologue] (UC! lectotype, mixed with sterile *Matelea* sp.).

Dictyanthus brachistanthus Standley, Publ. Field Columbian Mus., Bot. Ser. 8: 38. 1930. Lectotype: *Heyde & Lux ex J. D. Smith 6346* (F! lectotype, mixed with a sterile, probably apocynaceous, vine, photo from F neg. 51447 at F!; G! GH, mixed collection! K! MO! NY! US, 2 specimens, 1 a mixed collection! isolectotypes).

Plants twining vines. Stems woody and with thick corky bark below, at least at the base, herbaceous and lacking bark above, with dense short and glandular trichomes and dense to essentially absent, mostly straight, long trichomes to 2 mm long. Leaf blade ovate to wide-ovate or occasionally narrow-ovate or very-wide ovate, 31-98 (-122) mm long, 18-75 (-102) mm wide, indumentum above of sparse to moderately dense uncinate long trichomes and short trichomes on major veins, indumentum below of moderately dense to dense uncinate long trichomes, surface pusticulate to smooth, smaller veins slightly raised below or not, apex acuminate to attenuate, base lobate, lobes convergent to widely divergent, with 2-8 acropetiolar glands, margin often slightly thickened and revolute; petiole 15-70 mm long, with dense short and glandular trichomes and dense to essentially absent, mostly uncinate long trichomes. Inflorescence a simple, or more often a compound, condensed, helicoid cyme; primary peduncle 3-31 (-65) mm long, with dense short and glandular trichomes and dense to essentially absent, straight or uncinate long trichomes; bracts linear to lanceolate or lorate, 2-5 (-6) mm long, abaxial surface with dense short and straight or uncinate long trichomes, adaxial surface with sparse short trichomes or glabrous; pedicel 5-13 mm long, with indumentum of peduncle. Calyx lobes lanceolate to narrow-ovate or rarely ovate, (3.5-) 5-10 mm long, (1-) 2.0-3.5 (-4) mm wide, apex attenuate, with one or occasionally two glands below each sinus, abaxial surface with sparse to dense straight or uncinate long trichomes, surface often pusticulate, adaxial surface glabrous. Corolla shallowly campanulate, nearly rotate, base to sinus length 4-9 (-11) mm, limb broad, hardly distinct from short tube, margin slightly revolute; lobes 3.5-8.0 mm long, apex rounded or occasionally acute or obtuse, plane to somewhat reflexed, margin slightly revolute; indumentum within of dense, very small short trichomes except glabrous at base between corona lobes and especially dense in lines above corona lobes, glabrous outside or with sparse to moderately dense short and sparse straight long trichomes on distal part of limb and base of lobes, with shallow pockets alternate with corona lobes;

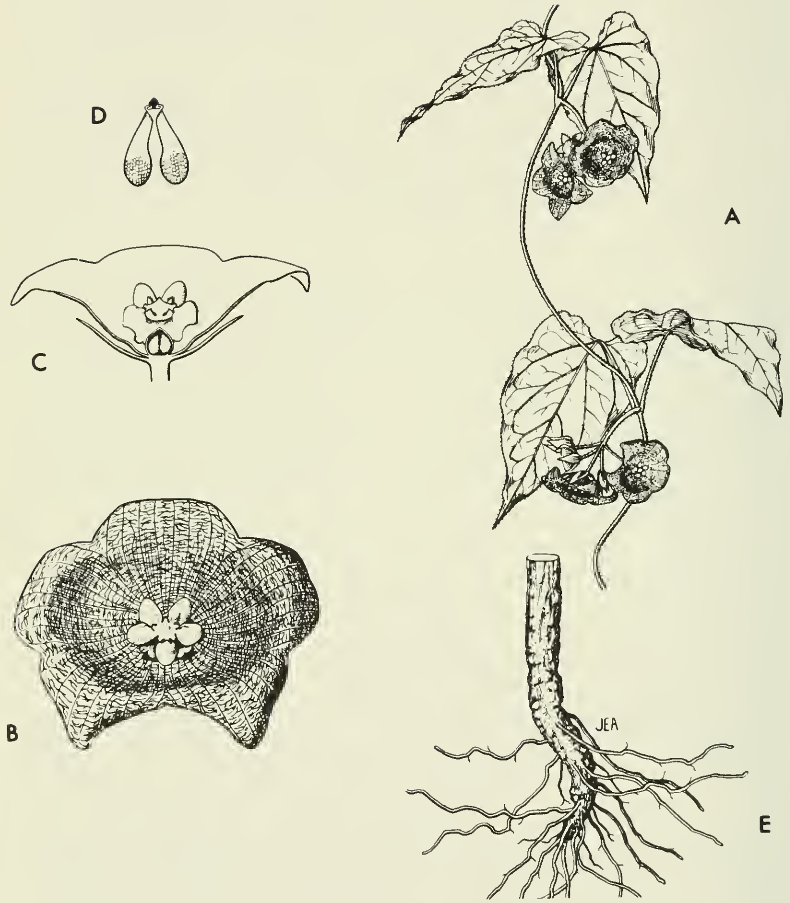

Figure 5. *Matelea aspera* (drawn from *Stevens 1296*). A. section of flowering stem, x 0.4; B-C. flowers, x 1.6; D. pollinium, x 12; E. base of stem, x 0.8.

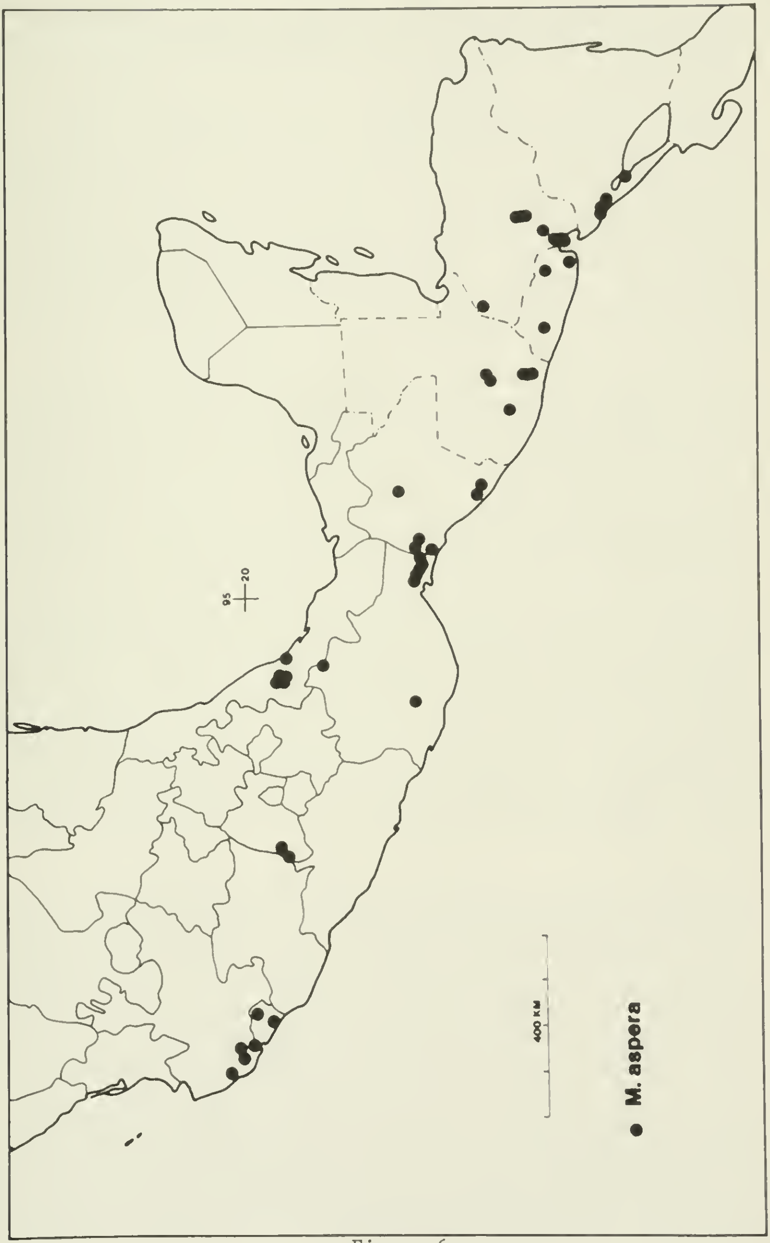

Figure 6.

background color very pale green (drying cream-white) to deep brownish-green, reticulations from essentially absent on the palest backgrounds to dense on the darker backgrounds, reticulations purple to brownish-purple. Corona lobes (1.5-) 2-3 (-4) mm long, ovate in outline from above, inflated, with a small tooth on the inner surface, lower half adnate to the corolla, free above, adnate to base of gynostegium, connate at base and forming a fleshy disc partially distinct from the lobes. Gynostegium (1.5-) 2-3 (-3.5) mm high and (1.5-) 2-3 mm wide at apex, slightly and shortly stipitate, anther wings prominent, apex essentially flat, terminal anther appendages covering ca half of apex. Corpusculum sagittate, 0.23-0.29 mm long, 0.20-0.26 mm wide, pollen sacs obliquely obovate, 0.89-1.04 mm long, 0.34-0.43 mm wide. Follicles fusiform, 62-87 (-113) mm long, 12-18 (-27) mm wide, apparently dark purplish-red or nearly black when mature but drying to lighter colors, with moderately dense to dense short trichomes, with 18-34 (-46) projections, these straight or slightly arcuate, mostly thick and blunt, to 5 or rarely even 7 mm long. Seeds obovate, 4-5 mm long, 2.0-3.5 mm wide, with a raised, radially-grooved margin, this entire or irregularly toothed, especially distally, one side convex and shallowly to deeply verrucate to rugose, other side concave and deeply rugose, with a shallow ridge from apex to near center, dark brown; coma 25-30 mm long, white. Figure 5.

Occurring from Jalisco and Colima southeastward to central Nicaragua. Figure 6. The areas where this species has been collected are rather widely spaced northwest of the Isthmus of Tehuantepec but are more continuous southeastward. Found from sea level to about 1000 m. Tolerant of a variety of substrates, including limestone-derived soils and beach sands, and a variety of communities, including pine forest at the highest elevations, but most commonly collected in disturbed thorn forests with clay soils. Flowering mostly June-October. Mature-sized fruit collected July-March.

Matelea aspera has a greater geographic range than most species of *Matelea* and is quite variable in appearance. Most of the variation, however, is in the size and coloration of the corolla. There is nearly a three-fold difference in the range of the corolla sizes; the largest-flowered specimens are found in the Pacific coastal lowlands of the Isthmus of Tehuantepec, and the plants from the mountains of Chiapas southeastward are rather uniformly small-flowered. Corolla color varies considerable, even within populations, but the palest corollas with faint or no reticulations are all found on Mexican plants and again the plants from the mountains of Chiapas southeastward are rather uniformly dark-colored. The northwestern part of the range tends also to have more substantially woody plants while plants in the southeastern part of the range tend to perennate from near ground level. Most of the other characters

of the species have less well-marked regional variation, and the corona, in particular, appears to be remarkably uniform throughout the range.

This is the type species of Woodson's (1941) *Matelea* subgenus *Pachystelma*. The previous two species, *Matelea sepicola* and *M. altatensis*, could be loosely allied with *M. aspera*, but the other two species Woodson included in the subgenus appear to be more distantly related. I am reluctant to add *M. sepicola* and *M. altatensis* to subgenus *Pachystelma* primarily because all of these species have clear affinities with subgenus *Matelea* sect. *"Reticulatae"* and subgenus *Heliostemma*. An adequate assessment of the subgenera of *Matelea* must await careful studies of more of the constituent species.

The type of *Cynanchum asperum* is apparently from a specimen cultivated by Miller from seeds sent from Veracruz by Houstoun in about 1730. I have seen only photographs of the holotype, but Dr. Garrett E. Crow compared the specimen, at BM, with samples of my material and confirmed its identity.

Through an apparent printer's error, the protologue of *Pachystelma cordatum* gives the type collection as *Purpus 8008*, but the UC accession number given corresponds to the marked type specimen, *Purpus 8508*. Unfortunately, *Purpus 8508* is a mixed collection. The majority of the sheet is *Matelea aspera*, but there is a sterile shoot and an isolated leaf of a second species of *Matelea*. The sterile specimen apparently did not influence the type description and I have therefore chosen the fertile element as the lectotype. It is interesting to note that even the fertile element has only very immature flower buds; this might explain why Brandegee failed to recognize that his new genus and species were the same as *Vincetoxicum megacarphum*, which he had described seven years earlier from another Purpus collection from a nearby locality.

In the case of the mixed collection of *Dictyanthus brachistanthus*, it appears that Standley based the vegetative aspects of the description on the sterile, probably apocynaceous, vine and based the description of the inflorescence and flowers on the element representing *Matelea aspera*. The name could probably be rejected on the basis of Article 70 of the International Code of Botanical Nomenclature (Stafleu et al., 1972), but on the basis of Standley's apparent intent, I have chosen to follow Article 9 and designate the fertile element as a lectotype.

SPECIMENS EXAMINED. *MEXICO*. JALISCO: steep ravines in gorge of Río Cihuatlán, below bridge 13 mi N of Santiago, Colima, 175-200 m, 3 July 1957 (fl), *McVaugh 15941* (MICH, 2 specimens); mountains 3 mi above (S of) La Huerta, rd to Barra de Navidad, 500-550 m, 3 Oct 1960 (fl & fr), *McVaugh 19805* (MICH, 2 speci-

mens); near new rd ca 25 km NW of Río San Nicolás and 20 km SE of Tomatlán, 90-150 m, 11-12 Dec 1970 (fr), *McVaugh 25314* (MICH, MSC); 0.5 mi N of La Resolana, 22 mi SSW of Autlán, ca 1000 ft, 11 Aug 1949 (fl), *Wilbur & Wilbur 2253* (MICH). COLIMA: Paso del Río, Nov 1906 (fr), *Emrick 224* (F); Colima, Aug 1897 (fl), *Palmer 164* (MICH, US). MEXICO: Dist. Temascaltepec, Bejucos, 610 m, 26 Aug 1932 (fl), *Hinton 1476* (GH, US); Dist. Temascaltepec, Chorrera, 7 Mar 1934 (fr), *Hinton 5741* (K), 19 Aug 1935 (fl), *Hinton 8189* (K, US). VERACRUZ: "dunes de Vera Cruz," June-Oct 1840 (fl), *Galeotti 1545*, type of *Gonolobus littoralis* (F, fragment of G specimen, G, photos from F neg. 26924 of G specimen at MO & P); "E. Vera Cruz," 1730 (fl), *Houstoun s.n.*, type of *Cynanchum asperum* (BM, not seen, photos from BH neg. 5251 at MICH & US); vicinity of Palmar, ca 3200 ft, 3 Sep 1935 (fl), *MacDaniels 452* (F); Baños del Carrizal, Aug 1912 (fl), *Purpus 6014*, type of *Vincetoxicum megacarphum* (F, G, 2 specimens, 1 a fragment of F specimen, GH, MO, 3 specimens, 2 are fragments, probably of UC specimen, NY, P, UC); Acaxónica, Aug 1919 (fl), *Purpus 8508*, lectotype of *Pachystelma cordatum* (UC, mixed with sterile *Matelea* sp.); ca 4.5 mi W of Palmilla along hwy through Huatusco, 10 Aug 1971 (fl), *Stevens 1406* (MSC). OAXACA: on Hwy 190, 1.5 mi SE of Niltepec, ca 50 m, 11 July 1972 (fl), *Denton 1776* (MICH, MSC, WTU); 9 mi W of Zanatepe [Zanatepec], 17 Aug 1971 (fl), *Dwyer et al. 755* (MO); 5 mi E of Temascal (10 mi W of Veracruz border), ca 45 ft, 25 Oct 1963 (fr), *Janzen s.n.* (MICH); along Hwy 190, 2 km S of Niltepec, 50 m or less, 17 July 1959 (fl), *King 1726* (TEX), *1752* (TEX), *1755* (MICH, NY, TEX, US); along Hwy 190, 2 km E of Zanatepec, 50 m or less, 21 July 1959 (fl), *King 1892* (MICH, NY, TEX, UC, US); Santa Efigenia, 500 ft, 18 July 1895 (fl), *Nelson 2824* (GH); 70 km (by rd) SE of Pinotepa Nacional on rd to Puerto Escondito, ca 150 m, 23 July 1965 (fl), *Roe et al. 521* (WIS); near bridge ca 4.0 mi SE of Zanatepec on Hwy 190, 21 July 1971 (fl), *Stevens 1296* (MSC); along Hwy 131 ca 3.6 mi N of river bridge near Juchatenango, 27 July 1971 (fl), *Stevens 1363* (MSC). CHIAPAS: slopes on bank of Río Lagas 4 mi SW of Soyala [?Soyaló] along rd to Pan American Hwy, 3400 ft, 26 July 1964 (fl), *Breedlove 6557* (DS, F, MICH, US); slopes S of Tapanatepec, near Oaxaca-Chiapas state line, 200 ft, 25 Aug 1967 (fl), *Clarke 462* (DS); Miramar, 11 Aug 1937 (fl), *Matuda 1624* (MEXU, MICH, 2 specimens, MO, NY); Aguas Calientes, Escuintla, 21 June 1947 (fl), *Matuda 16628* (F, MO); Jalapa, Triunfo, Escuintla, 900 m, 10 July 1948 (fl & fr), *Matuda 18103* (F); Playa Cintalapa, Escuintla, 2 June 1949 (fl), *Matuda 18657* (F); Valley of Jiquipilas, 2200-2800 ft, 16-18 Aug 1895 (fl), *Nelson 2937* (US, mixed with *Matelea quirosii*); plains near Monserrate, July 1925 (fl), *Purpus 10232* (US); rocky plains, Monserrate, June [?1930] (fl), *Purpus 10615* (UC); Monserrate, June [?1930] (fl), *Purpus 10638* [in part] (US); rocky plains, Monserrate, June-July [?1930] (fl), *Purpus 10638* [in part] (UC). STATE UNKNOWN: without locality and date (fl), *Sessé, Mociño, et al. 1300* (F, fragment, MA, not seen, photo from F neg. 41465 at MSC), *8568* (MA, not seen, photo from F neg. 41466

at MSC). *GUATEMALA*. EL PROGRESO: along rd between San Gerónimo and Morazán, near Baja Verapaz line, 1000 m, 9 Oct 1942 (fl), *Steyermark 52133* (F, MO). GUATEMALA: 10 km NE of Motúfar, rdside, 15 July 1970 (fl), *Harmon & Dwyer 3066* (UMO). QUICHE: without precise locality, 1942 (fl), *Ignacio A. 1363* (F). SANTA ROSA: plains of Llano Entero, SE of Chiquimulilla, ca 150 m, 30 Nov 1940 (fr), *Standley 78852* (F); region of La Morenita, NE of Chiquimulilla, ca 400 m, 1 Dec 1940 (fl), *Standley 78871* (F); along Avellana rd, S of Guazacapán, ca 150 m, 6 Dec 1940 (fr), *Standley 79422* (F). SOLOLA: Atitlán, 600 m, Feb 1894 (fl), *Heyde & Lux ex J. D. Smith 6346*, lectotype of *Dictyanthus brachistanthus* (F, mixed with a sterile, probably apocynaceous, vine, photo from F neg. 51447 of F specimen at F, G, GH, mixed collection, MO, NY, US, 2 specimens, 1 a mixed collection). *EL SALVADOR*. MORAZAN: along ditch to reservoir, Monte Cristo, 9 Dec 1941 (fl), *Tucker 497* (UC). SAN MIGUEL: NW of Hacienda Potrero Santo, ca 0.1-0.8 km, S side of Lake Olomega, 13° 17' N, 88° 04' W, ca 60 m, 2 Feb 1942 (fr), *Tucker 881* (UC). SAN SALVADOR: San Salvador, 1922 (fl), *Calderón 781* (US). DEPARTMENT UNKNOWN: between San Sabastián and Aculhuaca, 1922 (fl), *Calderón 1182* (US). *HONDURAS*. CHOLUTECA: vicinity of Pespire, 160-200 m, 18-27 Oct 1950 (fl), *Standley 27100* (F), 18-27 Oct 1950 (fr), *Standley 27181* (F). COPAN: along Copán river between Sta. Rita and Jaral, 700 m, 21 Aug 1971 (fl), *Molina R. 26209* (F, US). EL PARAISO: drainage of Río Yeguare (ca 87° W, 14° N), entre Mata Indio y Lizapa, 950 m, 25 July 1951 (fl), *Molina R. 4065* (F, GH, US). MORAZAN: drainage of Río Yeguare (ca 87° W, 14° N), Yeguare River, 2600 ft, 16 July 1948 (fl), *Glassman 1919* (F, ILL, MIN, NY); drainage of Río Yeguare (ca 87° W, 14° N), along Jicarito Creek, near Jicarito, 950 m, 13 Aug 1947 (fl), *Molina R. 481* (F); vicinity of El Zamorano, 780-900 m, 3-17 Aug 1947 (fl), *Standley 11593* (F), *11648* (F), *11726* (F); above El Zamorano, rd from Jicarito toward El Pedregal, ca 875 m, 14 Aug 1947 (fl), *Standley 12236* (F); vicinity of El Zamorano, ca 800 m, 6 Oct 1948 (fl), *Standley 12878* (F); near Santa Clara, valley of Río Yeguare, E of El Zamorano, ca 850 m, 19 Oct 1948 (fl), *Standley 13187* (F); trail from La Quince, El Zamorano, to El Jicarito, 800-900 m, 15 July 1949 (fl), *Standley 21286* (F); near El Jicarito, along rd toward El Pedregal, ca 900 m, 24 July 1949 (fl), *Standley 21637* (F); vicinity of El Zamorano, 800-850 m, 26 July 1949 (fl), *Standley 21736* (F); region of Río de Orilla, SE of El Zamorano, 900-950 m, 11 Aug 1949 (fl), *Standley 22446* (F, GH); along Quebrada El Gallo above El Jicarito, 900-1000 m, 12 Aug 1949 (fl), *Standley 22517* (F); vicinity of El Zamorano, 800-850 m, 16 Aug 1949 (fl), *Standley 22686* (F); along rd from El Zamorano toward Chagüite, ca 800 m, 5 Aug 1950 (fl), *Standley 26279* (F, GH, US); mountains above El Jicarito, 950 m, 21 Aug 1951 (fl), *Standley 28638* (US); Camino Sn. Antonio, 850 m, 21 Oct 1943 (fl), *Valerio R. 1345* (F, MO); vicinity of El Zamorano, along rd to Chagüite, ca 2200 ft, 23 July 1962 (fl & fr), *Webster et al. 12523* (MO); drainage of Río Yeguare (ca 87° W, 14° N), ca

3 km E of Chagüite, 850 m, 25 Sep 1949 (fl), *Williams 16873* (F, GH). VALLE: Salamar Beach, 2 km E of San Lorenzo, Fonseca Gulf, 0 m, 3 Oct 1968 (fl), *Molina R. & Molina 22762* (DS, F, G, 2 specimens, MO, NY); San Lorenzo, 20 m, 13 Sep 1945 (fl), *Valerio R. 3473* (F, 2 specimens, GH, MO); lower slopes of El Tigre volcano, above Ampala [Isla El Tigre], 50 m, 16 Sep 1935 (fl), *West 3537* (GH). *NICARAGUA*. GRANADA: "Grenade de Nicaragua," Autumno 1869 (fl), *Lévy 1071* (P). LEON: Volcán Santa Clara near Hwy 26 [Volcán Rota?], 600 m, 19 July 1970 (fl), *Davidse & Pohl 2407* (MSC). CHINANDEGA: Ameya, near sea level, 19-21 June 1923 (fl), *Maxon 7159* (US); vicinity of Chichigalpa, ca 90 m, 12-18 July 1947 (fl), *Standley 11217* (F), *11395* (F), *11474* (F), *11526* (F). DEPARTMENT UNKNOWN: "Leoncia 2.," 16 Oct 1927 (fl), *Chaves* [*Chávez*] *325* (US).

Matelea prosthecidiscus Woodson, Ann. Missouri Bot. Gard. 28: 223. 1941.
Prosthecidiscus guatemalensis J. D. Smith, Bot. Gaz. (Crawfordsville) 25: 150, pl. 12. 1898, *non Matelea guatemalensis* (K. Schumann) Woodson. Type: *Heyde & Lux ex J. D. Smith 3845* (US! holotype).

Heretofore this peculiar species has been definately known only from Guatemala and Nicaragua and its mature fruits were unknown (cf. Standley & Williams, 1969). A number of fruiting collections from Mexico appeared to be similar, but it was not until I had grown to flowering two Mexican collections (from seeds of *McVaugh 24439* and *McVaugh 25388*), and later collected flowering material myself, that I was able to confirm that they were conspecific with the type material. Because this significantly amplifies the known range of the species, I have provided a list of specimen citations.

Woodson (1941) included this species in his subgenus *Ibatia*, but I can find little justification, other than in the shape of the pollinia, for this disposition. Although I believe that certain elements of Woodson's concept of *Matelea*, especially his subgenus *Pherotrichis* and the type element of his subgenus *Macroscepis*, warrant generic status, I am tentatively willing to accept that this is a proper species of *Matelea*, but probably standing apart from any of Woodson's subgenera. There is little point, however, in formally proposing additional infrageneric taxa until this most complex genus is better understood.

SPECIMENS EXAMINED. *MEXICO*. JALISCO: steep mountain ravines, near hwy to Autlán, 9-10 rd mi N of Bahía Navidad (2-5 mi above edge of coastal plain), 350-400 m, 10 Nov 1960 (fr), *McVaugh 20945* (MICH); steep mountainsides 2.5-4 mi above (N of) La Cuesta, rd to Talpa de Allende, 800-1000 m, 20-21 Nov 1960 (fr), *McVaugh 21196* (MICH); steep hillsides ca 12-13 km SW of Pihuamo, 500-600 m, 19 Nov 1970 (fr), *McVaugh 24439* (MICH, 2 specimens,

MSC); Mpio. de Cabo Corrientes, steep rocky valley of Río las Juntas, 10-13 km SE of Tuito, 250-330 m, 14-16 Dec 1970 (fr), *McVaugh 25388* (MICH, MSC); along Hwy 110 ca 5.0 mi NE of Río Tuxpan bridge and ca 2.0 mi NE of Huizache, steep hills SE of hwy, 28 Aug 1973 (fl), *Stevens 1811* (MSC). GUERRERO: Dist. Mina, Cutzamala, 28 Jan 1935 (fr), *Hinton 7290* (US); La Correa, 50 m, 2 Oct 1898 (fr), *Langlassé 398* (US). OAXACA: Dist. Jamiltepec, de Río Verde a Jamiltepec, 50 m, 4 Dec 1921 (fr), *Conzatti 4395* (US). CHIAPAS: Jilguero, Escuintla, 250 m, 7 Nov 1949 (fr), *Matuda 18702* (F). *GUATEMALA*. HUEHUETENANGO: Paso del Boquerón, along Río Trapichillo, below La Libertad, 1200-1300 m, 21 Aug 1942 (fl), *Steyermark 51149* (F). SANTA ROSA: Cerro Gordo [2.5 leagues NW of Cenaguilla, according to type description], 360 m, Sep 1892 (fl), *Heyde & Lux ex J. D. Smith 3845*, type of *Prosthecidiscus guatemalensis* (US). *EL SALVADOR*. AHUACHAPAN: vicinity of Ahuachapán, 800-1000 m, 9-27 Jan 1922 (fr), *Standley 19916* (US). *NICARAGUA*. MANAGUA: Managua, 16 Oct 1927 (fr), *Chaves* [*Chávez*] *348* (F, US).

Matelea congesta (Decaisne *in* deCandolle) Woodson, Ann. Missouri Bot. Gard. 28: 224. 1941.
Gonolobus congestus Decaisne *in* deCandolle, Prodr. 8: 597. 1844. Type: *Galeotti 1528* (P, not seen, holotype).
Vincetoxicum congestum (Decaisne *in* deCandolle) Standley, Contr. U. S. Natl. Herb. 23: 1189. 1924.

Woodson (1941) placed this species in his subgenus *Macroscepis*. As noted above, subgenus *Macroscepis* is a heterogeneous group. This species would seem to be more appropriately placed in subgenus *Chthamalia*. Since most of the available material has been examined, I am including a list of the specimens.

SPECIMENS EXAMINED. *MEXICO*. NAYARIT: mountains 10 mi SE of Ahuacatlán, on rd to Barranca del Oro, slopes S of divide, 1100-1300 m, 11-12 Aug 1959 (fl), *Feddema 385* (MICH); near hwy 12 mi SE of Tepic, nearly S of Cerro Sangangüey, ca 1000 m, 16-18 Aug 1959 (fl), *Feddema 554* (MICH); slopes and barrancas leading down to lake NE of Santa María del Oro, ca 1000 m, 18-20 Aug 1959 (fl), *Feddema 661* (MICH); ca 10 mi SE of Ahuacatlán along rd to Barranca del Oro, 26 Aug 1971 (fl), *Stevens 1462* (MSC). JALISCO: Mpio. de Zapopan, Río Blanco, barranca, 1460 m, 5 Aug 1967 (fl), *Díaz Luna 302* (MICH); steep rocky hills 2 mi NW of Tequila, 1200 m, 3 Sep 1960 (fl), *McVaugh 18628* (MICH); barranca near Guadalajara, 11 Sep 1890 (fl), *Pringle 3569* (F, GH); near Guadalajara, 25 Aug 1893 (fl), *Pringle 4489* (ENCB, F, G, 2 specimens, GH, K, MICH, MSC, PH, UC, US), 9 Aug 1902 (fl), *Pringle s.n.* (US). MICHOACAN: lower N-facing slopes of Cerro Santa María, 8-10 km SW of Jiquilpan and 5 km NE of Quitupan, Jalisco, ca 2000 m, 5-7 Aug 1959 (fl), *Feddema 92* (MICH); Mpio. Apatzingan, above Acahuato, 3200 ft, 17 Aug 1941 (fl), *Leavenworth & Hoogstraal 1683* (F). MEXICO: Dist. Temascaltepec, Tejupilco, 1340 m, date not given (fr), *Hinton 5060* (K). GUERRERO: Dist. Montes de Oca, Vallecitos,

20 Sep 1937 (fl), *Hinton 11394* (F, GH, US); near Tierra Colorada, 16 Aug 1947 (fl), *Rowell et al. 17M763* (F, TEX). OAXACA: Pacific slopes of Sierra Madre del Sur, along rd to Puerto Angel (Mex. Hwy 175), 16 mi S of San Miguel Suchixtepec, 1550 m, 16 July 1968 (fl), *Anderson & Anderson 4813* (MICH); Santa Ana Cuyamecalco, 5500 ft, 15 Aug 1895 (fl), *Smith 617* (GH); ca 4.9 mi SW of Sola de Vega along Hwy 131, 26 July 1971 (fl), *Stevens 1348* (MSC).

The problems associated with Sessé and Mociño collections have been greatly lessened by Dr. Rogers McVaugh's unpublished notes on the subject and by reference to the Field Museum photographs of the Sessé and Mociño herbarium, kindly made available to me by Dr. McVaugh and Dr. Lorin I. Nevling, Jr., respectively. I am also indebted to the curators of the cited herbaria for allowing me to examine their material. Field work for my studies has been aided by a grant from the Latin American Studies Center, Michigan State University, and by the University of Michigan Herbarium. Figures 1 and 5 were prepared by Judy Appenzeller, supported by NSF Grant GJ-573. Dr. Richard Harris, University of Michigan, kindly reviewed my Latin diagnosis. Dr. John H. Beaman has been continuously helpful in reviewing various aspects of my work.

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CONSIDERATIONS ON THE EVOLUTION OF LICHENS

Harold Robinson
Department of Botany
Smithsonian Institution, Washington, D.C. 20560.

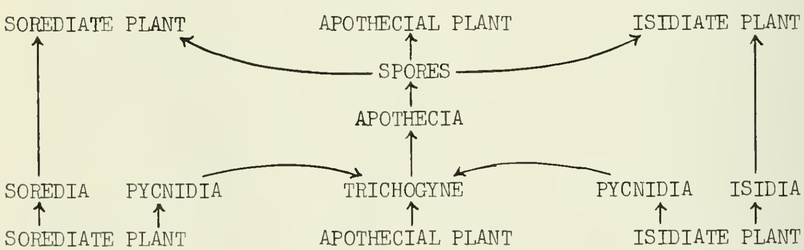
To the casual observer the taxonomic study of lichens does not seem much different from that of other groups of plants. The process of cataloguing phenotypes has produced listings of families, genera, and species. The variations and functions of lichen structures have been studied. Ecological tolerances have been recorded. Phytogeographical data have been plotted. Chemical characters have been used extensively. There is one difference in lichen taxonomy, however, that affects the interpretation of all the other aspects. In lichenology there is no direct knowledge of progeny or genetics. Concepts of populations are reconstructed entirely from examination of static characters of individual specimens with no proof that "species" reliably reproduce their own kind. Until recently not a single lichen had been carried through to a second generation experimentally.

For the valid work of cataloguing phenotypes there is no need to know precise relationships, but recently lichenologists have begun to speculate on the origins of some species. Most important of these is the suggestion by Poelt (1972) that some sorediate and isidiate species would always be the derivatives of non-sorediate and non-isidiate apothecial forms and they could never be ancestral to such forms. Such a concept is the ultimate result of the belief that every phenotype in lichens is the monophyletic result of oneway mutations. Unsaid but implied by such a concept is the presence of unseen tendencies among the vast majority of lichens to produce these recurring mutations. One would suspect that there is an easier explanation for the manner that sorediate, isidiate, and chemical characters recur in so many different combinations in lichens.

An answer to the recurring characters of lichens might be found in sexual reproduction and hybridization. Lichens do possess structures for a sexual life cycle. The question remains, why do lichens have sexual reproduction and how much does it function? Part of the answer is found in the same basic reasons why any organism has sexual reproduction: sex allows favorable mutations to come together in one individual and allows elimination of unfavorable mutations. The non-sexual organism is barred from gaining any favor-

able mutation, even one in a close relative, or rejecting deleterious genes, except by separate and rare mutations. Animals, plants and even bacteria have all developed ways of trading genetic material and they have maintained these systems with very few exceptions. Sexual reproduction and recombination of genes has played a major role in evolution of other groups, and it seems likely that it has done the same in lichens.

The theoretical life-cycle of the lichen is well known. The various structures such as pycnidia, spermatia, trichogynes, ascogenous hyphae and asci are in all mycological texts. The apothecia and perithecia of lichens are the most obvious aspects of the life-cycle but the most functionally important are the pycnidia and trichogynes. Sorediate and isidiate lichens that lack apothecia may have pycnidia. What would happen if the spermatia from a sorediate lichen managed to reach the trichogyne of an apothecial specimen? Would plants that differ only by sorediate or isidiate conditions or by a few chemicals or by ecological tolerances (Culberson, 1969) be unable to fertilize each other? The biological barriers to fertilization need not be closely correlated with other characters.



It is true that sorediate, isidiate, and apothecial lichens are all capable of perpetuating themselves indefinitely without interbreeding with each other, and perhaps, for the most part, they do. It might be difficult for spermatia of one lichen to reach the trichogyne of another lichen even when the two were entangled on the same twig. Still, if it happened only once in a million years it would provide a simple explanation for the recurring combinations of lichen characters.

There is no reason why hybrids in lichens would produce any strange or unknown combinations of characters. The plants studied by lichenologists are all

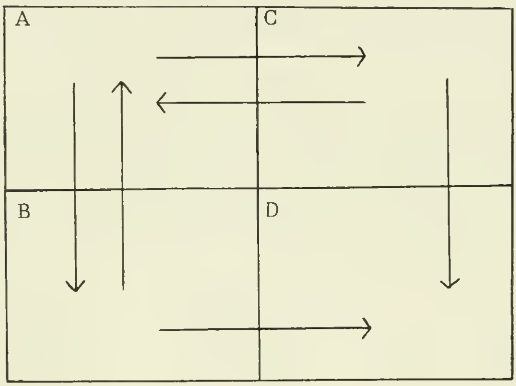
supposedly haploid. The only truly hybrid cells in the lichen are in the ascogenous hyphae and the spores already have the resegregated genes of the next generation. If single gene differences were involved or two genes that were closely linked then the spores would give rise to plants exactly like the two parents. If more characters are involved and they are not closely linked on the same chromosome then recombinations of parental genotypes can occur. What is most important to recognize is that two genotypes can come from the same ascus and innumerable "species" might come from the spores of the same apothecial plant without any indication unless their precise origin were traced. The spores could give rise to perfectly recognizable and even ecologically distinct forms.

Culture of lichen spores could furnish proof of the presence of hybridization. An initial study of this type has shown minor variations in progeny of *Cladonia cristatella* Tuck. (Ahmadjian, 1964). Proof might be obtained without culturing if the interbreeding species have an observable spore difference. For the present, however, the best evidence of hybridization in lichens is indirect.

Poelt (1972) bases his concept on the phenomenon of species pairs. Actually, the situation in some lichen groups is far more complex. In some cases lichen species can be presented in an interrelated checkerboard pattern. Each species differs from two others by a single character. Often more characters

Species A sorediate chem X	Species C non-sorediate chem X
Species B sorediate chem Y	Species D non-sorediate chem Y

and more species are involved in such interrelationships. Such patterns are common enough in some lichen groups that it has hardly seemed necessary to wait for a specimen to describe some of the species. Such patterns often involve only chemical and no sorediate or isidiate forms. No one seems to have looked fully at the implications of such patterns. Even if one assumes the non-sexual origin of such patterns through mutations the probability of getting all four types is no greater than the probability of getting at least one of the types twice. Given the frequency of such



patterns it is inevitable that some of the species involved are polyphyletic. This is true no matter what the mechanism of origin. The concept of species in lichenology would need reevaluation in any case.

It seems unlikely that individual mutations are the source of the variants in the checkerboard patterns and I suggest that they are the products of hybridization and resegregation of genes. Complete checkerboard patterns could be interpreted to mean that interfertilization was possible in the group of species involved. More important from the viewpoint of true phylogeny would be the groups in which such species clusters did not occur.

One excellent study (Culberson & Culberson, 1973; Culberson, 1973) provides evidence on the character stability in one group of apparently closely related species of lichens. The study of the <u>Parmelia hypotropha</u> - <u>P. perforata</u> group (now <u>Parmotrema hypotrophum</u> (Nyl.) Hale and <u>P. perforatum</u> (Jacq.) Mass.

see Hale, 1974) is complicated by the difference in ecological tolerance that correlates with the difference between chemical species. Still, it is evident that the chemically distinct forms must not have produced any recombinations during the post-glacial period in which they have had their present distributions. There is no such evidence for isolation between sorediate and non-sorediate forms which are sympatric and which could hybridize without producing any new combinations of characters. The study shows the fallacy of previous tendencies to value sorediate differences more than chemical differences. The study is flawed only by the acceptance of the Poelt idea that sorediate species are necessarily derived from chemically identical apothecial species by "the production of soredia and the subsequent suppression of sexuality".

The present view of lichen speciation would still accept mutation as the original source of chemical and structural characters but not as the source of most of the numerous present combinations of these characters. The present view would not require much less stability of lichen "species" in nature than is generally suspected, but it would suggest that when changes do occur they are mostly from hybridization rather than from mutation, and that some "species" may have originated more than once.

One can visualize the evolution of lichens being as in other groups of plants, the gradual differentiation of interbreeding populations containing many genotypes. Such lichen populations would include apothecial, sorediate, and isidiate forms along with many chemical variants. Many seeming parallelisms would be the result of genetic recombination, and actual mutation would play a lesser role. Eventual biological isolation would tend to restrict the chemical variations available in any evolving group since only certain variations would be available within the interbreeding group.

The apothecial, sorediate, and isidiate variations of lichens would be more consistently maintained in the populations than would the chemical variants because of the reproductive requirements involved. Any completely sorediate and isidiate forms would require apothecial forms for their sexual reproduction and for the resulting potential for genetic recombination and accelerated evolution. Of course, there might be cases where sorediate forms have become isolated and are really vegetatively reproducing dead-ends with all possible interbreeding apothecial forms extinct.

Apothecial forms of lichens also have a more basic dependence on sorediate and isidiate forms. It would seem that such forms would be the only source from which spores from the apothecia could obtain the lichen symbiont, Trebouxia. This would seem particularly true of soredia. It would require sorediate forms to be present in all populations. Such sources of soredia need not be related closely to the apothecial form and probably often are not as evidenced by the wide distribution of algal species in lichens (Ahmadjian, 1960). The only requirement would be that the hyphae from the spores would be faster growing or possess some other biological advantage over the hyphae already present in the soredium. One can speculate that the extinction of some particularly vulnerable soredial lichen might result in the extinction of many other species that depend on it as a source of Trebouxia. Almost certainly the long evolutionary history of lichens has produced some careful balances between the populations of apothecial and sorediate forms and undoubtedly the hybridizationa and recombinations play a major role in maintaining this balance.

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Acknowledgements

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A NEW SPECIES OF BARNADESIA FROM ECUADOR (MUTISIEAE: ASTERACEAE)

Harold Robinson

Department of Botany
Smithsonian Institution, Washington, D.C. 20560

The genus Barnadesia is distributed through the north and central Andes of South America with the greatest number of species in the area of Peru. Two recent treatments have appeared, a monograph of the genus by Chung (1965) recognizing 19 species, and a treatment of the Peruvian species by Ferreyra (1964) which recognized 4 new species of which 3 were not included in the Chung monograph. Ferreyra's fourth species, B. wurdackii is evidently the same as and takes priority over B. chachapoyensis Chung. An additional species has been collected by R.M.King in southern Ecuador which is described here as new.

Barnadesia (subg. Penthea) kingii H.Robinson, sp. nov. Plantae frutescentes usque ad 1 m altae mediocriter ramosae. Caules superne dense fulvo-hirtelli inferne glabrescentes rubescentes striati, spinis axillaribus plerumque duplicibus 2-10 mm longis. Folia plerumque 3-5 in fasciculis alternatis subsessiles obovata plerumque 15-25 mm longa 8-15 mm lata integra base breviter cuneata apice minute et argute apiculata supra sparse sericea subtus dense fulvo-sericea, nervis secundariis utrinque plerumque 2 valde ascendentibus. Capitula 2-3 in fasciculis cymosis ca. 4 cm longa; involucra cylindrica 2.5-3.0 cm longa ca. 1 cm lata; squamae involucri ca. 45 rubescentes 2-27 mm longae 1-2 mm latae 7-9-seriatae extus sparse puberulae apice leniter reflexae, squamis inferioribus ovatis vel lanceolatis apice acutis pungentibus, squamis superioribus linearibus apice peranguste acutis. Flores marginales ca. 13; corollae lavandulae extus dense albo-sericeae, tubis ca. 20 mm longis, limbis exterioribus oblongis ca. 11 mm longis et 2 mm latis apice anguste quadrilobatis, lobis ca. 1 mm longis, lobis marginalibus ca. 0.4 mm latis, lobis mediis ca. 0.2 mm latis, limbis interioribus setiformibus ca. 9 mm longis; filamenta non connata ca. 1.5 mm longa; thecae ca. 5 mm longae; appendices

antherarum ca. 2.5 mm longae; achaenia albo-sericea ca. 1 mm lata; setae pappi ca. 20 plumosae plerumque 10-12 mm longae base breviter connatae. Flores disci 3; corollae ca. 12 mm longae irregulares extus albo-sericeae in faucis dense sericeae intus in faucis pauce setiferae, tubis ca. 4 mm longis, limbis plerumque quadrilobatis, lobis ca. 2 mm longis, limbis interioribus perlinearibus ca. 9 mm longis; filamenta ca. 4.5 mm longa; thecae ca. 4 mm longae; appendices antherarum ca. 3 mm longae; achaenia ca. 1.8 mm lata; setae pappi ca. 20 spiniformes variabiliter incrassatae reflexae vel contortae glabrae usque ad 10 mm longae base late et irregulariter connatae. Grana pollinis ca. 45u diam. psilolophata.

TYPE: ECUADOR: Prov. Azuay: along the road to Girón, ca. 13 kms generally SW of Girón. Elev. ca. 6300 ft. One armed shrub ca. one meter tall, open sun, flowers lavender. Feb. 3, 1974. R.M.King 6685 (Holotype US).

Barnadesia kingii superficially resembles *B. spinosa* L.f. of Colombia but that species is in the subgenus *Barnadesia* which differs by the elongate connate anther filaments of the marginal flowers. The new species keys in the Chung treatment to *B. lehmannii* from which it differs by the broader obtusely tipped phyllaries. The species may also be close to *B. hutchinsonii* Ferreyra but the latter differs most notably by the larger heads with more rows of phyllaries. The new species is most distinctive in the small heads with slender-tipped phyllaries in 7-9 series and in the pappus of the disk flowers which consists of stout glabrous recurved or contorted segments. The short obovate leaves have more prominent lateral veins and denser sericeous pubescence on the upper surface than in most related species.

Acknowledgement

The specimen was collected during field work supported by the National Geographic Society.

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Barnadesia kingii H.Robinson, Holotype, United States National Herbarium. Photo by Victor E. Krantz, Staff Photographer, National Museum of Natural History.

Barnadesia kingii H.Robinson, enlargement of head and flowers.

STUDIES IN THE HELIANTHEAE (ASTERACEAE). V. TWO NEW SPECIES OF *ASPILIA* FROM SOUTH AMERICA

H. Robinson and R. D. Brettell
Smithsonian Institution, Washington, D.C. 20560

Among the species placed in the genus *Aspilia* are a few with peculiar black spots scattered through the leaf and in the involucral bracts. These spots are distinct from the bruises that often occur in pressed leaves at the bases of the stiff hairs. One species in particular, *A. verbesinoides* (DC.) Blake of Trinidad, has been noted for such black markings and *A. nigropunctata* Blake of Trinidad is regarded as a synonym. Colombian and Bolivian material has now been seen representing two related undescribed species. The two new species are named for their collectors.

Aspilia archeri H.Robinson & R.D.Brettell, sp. nov.

Plantae herbaceae perennes usque ad 1.5 m altae pauce ramosae. Caules subtiliter hexagonales fulvi sparse antrorse scabridi. Folia opposita, petiolis 1.5-4.0 cm longis, laminis ovatis 9-13 cm longis 3.5-5.0 cm latis base acuminatis fere ad basem trinervatis margine serrulatis apice breviter acuminatis supra et subtus antrorse pilosis subtus pallide viridibus sparse minute nigro-punctatis. Inflorescentiae plerumque trifidae brevipedicellatae, pedicellis 0.7-1.7 cm longis dense puberulis. Capitula 1 cm alta 0.8-1.0 cm lata; bracteae involucri exteriores anguste oblongae vel ellipticae 1.5 cm longae 3-4 mm latae breviter acutae dense puberulae; bracteae interiores 5 late oblongae vel obovatae 6-7 mm longae 3.5-4.0 mm latae apice obtusae extus scabride puberulae 2-3 lineariter nigro-punctatae, paleae ca. 7 mm longae anguste oblongae flavae in medio extus anguste alatae distincte nigro-lineatae superne vix constrictae apice fuscae distincte breviter oblongae 1 mm longae et latae obtusae. Flores radii 5? steriles; corollae minute usque ad 2 mm longae. Flores disci ca. 17; corollae sordide viridescentes vel nigrescentes ca. 5 mm longae inferne glabrae, tubis ca. 1.5 mm longis, faucis ca. 2.5 mm longis anguste infundibularibus,

lobis ca. 1 mm longis 0.5 mm latis extus puberulis; thecae antherarum ca. 1.4 mm longae nigrescentes, appendicibus ca. 0.3 mm longis anguste ovatis intus pallescentibus extus nigrescentibus; achaenia ca. 7 mm longa obovata quadrangularia usque ad 2.5 mm lata subtiliter rugosa sparse minute puberula superne valde constricta, coronis ca. 1 mm longis et latis breviter fimbriatis. Grana pollinis 23-25 μ diam. dense hispidula.

TYPE: COLOMBIA: Intendencia del Choco: Headwaters of Rio Tutunendo, east of Quibdo, herb 4 ft., flowers greenish. May 20, 21, 1931. W.A.Archer 2173 (Holotype US); Tutunendo, 20 kms. north of Quibdo; altitude about 80 meters. May 19, 20, 1931. W.A. Archer 2148 (US); Between La Oveja and Quibdo, "Botoncilla" Good liver remedy. April 1,2, 1931. W.A.Archer 1704 (US).

The new species has the heads in groups of three as in *A. verbesinoides* (DC.) Blake, but the latter differs by the outer phyllaries not being longer than the inner, the outer surface of the inner phyllaries being glabrous, the rays being larger, the disk corollas not being blackened with age, and the lower epidermis of the leaf not being as loose but instead having closer reticulations of the veins evident.

Aspilia steinbachii H.Robinson & R.D.Brettell, sp. nov.

Plantae herbaceae perennes 0.5 m altae pauce ramosae. Caules tetragonales vel hexagonales fulvi sparse antrorse scabridi. Folia opposita, petiolis 1.0-6.5 cm longis, laminis ovato-lanceolatis 7.0-12.5 cm longis 3.0-4.5 cm latis base breviter acuminatis fere ad basem trinervatis margine minute serrulatis apice anguste acuminatis supra et subtus scabride pilosis subtus parum pallidioribus sparse minute nigro-punctatis. Inflorescentiae plerumque simplices longae pedicellatae, pedicellis plerumque 4.5-7.5 cm longis dense puberulis. Capitula 1.0-1.5 cm alta; bracteae involucri exteriores 5-6 lanceolatae 12-15 mm longae 3-4 mm latae extus scabride puberulae inferne nigro-lineatae superne intramarginaliter nigro-punctatae; bracteae interiores ca. 7 oblongo-orbiculares 7-8 mm longae 4.0-5.0 mm latae margine sensim latae scariosae apice vix apiculatae extus glabrae vel sparse puberulae nigro-lineatae superne nigro-punctatae; paleae ca. 5 mm longae 1.5 mm latae anguste oblongae flavae in medio nigro-lineatae superne

constrictae apice distincte oblongae 1 mm longae 0.5 mm latae obtusae. Flores radii ca. 10 steriles; corollae ca. 7 mm longae pallide flavescentes glabrae, tubis ca. 1.7 mm longae, limbis ellipticis 5-6 mm longis ca. 3.5 mm latis inferne intramarginaliter nigro-lineatis. Flores disci ca. 30?; corollae flavae vel superne fuscae 4.0-4.5 mm longae inferne glabrae, tubis ca. 1.5 mm longis, faucis ca. 2 mm longis anguste infundibularibus, lobis ca. 0.7 mm longis et 0.6 mm latis extus minute puberulis; thecae antherarum ca. 1.5 mm longis nigrescentes, appendicibus ca. 0.3 mm longis ovatis nigrescentibus; achaenia ca. 3 mm longa obovata subquadrangularia usque ad 1.3 mm lata subtiliter rugosa sparse minute puberula superne valde constricta truncata, coronis perbrevis vix fimbriatis. Grana pollinis ca. 23 μ diam. hispidula.

TYPE: BOLIVIA: Depto. Cochabamba: Prov. Chapare, Todos Santos, elev. 300 mtrs, Herbacea 0,50 mtrs., flores anaranjado amarillento. Oct. 27, 1966. R.F. Steinbach 446 (Holotype WIS; isotype frag. US).

Aspilia steinbachii differs from both A. archeri and A. verbesinoides by usually having single heads at any node. The species differs further from A. archeri by the closer reticulations on leaf undersurface, by the more lanceolate outer phyllaries, by the glabrous outer surface of the inner phyllaries, by the larger and more numerous ray flowers and by the yellower disk flowers.

Aspilia archeri H.Robinson & R.D.Brettell, Holotype, United States National Herbarium. Photo by Victor E. Krantz, Staff Photographer, National Museum of Natural History.

Aspilia archeri H.Robinson & R.D.Brettell.
Enlargement of head.

Aspilia steinbachii H.Robinson & R.D.Brettell, Holotype, University of Wisconsin Herbarium.

Aspilia steinbachii H.Robinson & R.D.Brettell.
Enlargement of head.

STUDIES IN THE HELIANTHEAE (ASTERACEAE). VI.

ADDITIONS TO THE GENUS, CALEA

Harold Robinson
Smithsonian Institution, Washington, D.C. 20560

One new species has been encountered among collections from Ecuador and the generic limits between Calea and the segregates Geissopappus and Tyleropappus are reevaluated.

Calea kingii H.Robinson, sp. nov.

Plantae frutescentes usque ad 4 dm altae multo ramosae. Caules teretes striati dense pilosae glabrescentes rubescentes. Folia opposita, petiolis 3-7 mm longis; laminae late ovatae vel deltoideae plerumque 2.0-5.5 cm longae 1.2-4.5 cm latae fere ad basem trinervatae base truncatae vel late rotundatae margine serratae vel crenato-serratae apice late acutae vel breviter acuminatae supra dense scabrellae subtus plerumque in nervis dense hirsutae. Inflorescentiae subumbellatae, pedicellis usque ad 1 cm longis dense puberulis. Capitula 10-14 mm alta 8-10 mm lata; squamae involucri ca. 20 flavescentes in apicem brunnescentes ca. 4-seriatae valde inaequilongae 2-8 mm longae 2.0-2.5 mm latae oblongae apice late rotundatae et subscariosae extus glabrae; paleae 6-7 mm longae ca. 2.5 mm latae margine scariosae superne plus minusve laciniatae apice anguste acuminatae. Flores radii 6-8; corollae flavae ca. 8.5 mm longae glabrae, tubis ca. 4 mm longis, limbis ellipticis 4.5 mm longis et 1.5 mm latis. Flores disci ca. 20; corollae aurantiacae ca. 7 mm longae glabrae, tubis 3 mm longis, lobis ca. 2 mm longis et 0.5 mm latis; filamenta ca. 2 mm longa, in parte superiore ca. 0.4 mm longa; thecae ca. 2 mm longae; appendices antherarum ca. 0.4 mm longae. Achaenia prismatica ca. 2.5 mm longa superne setifera; squamae pappi ca. 25 ca. 6 mm longae late lineatae apice filiformes. Grana pollinis ca. 25μ diam. spinosa.

TYPE: ECUADOR: Azuay: along the road to Girón, ca. 10 kms NE of Girón. Elev. ca. 8600 ft., locally abundant, ca. 1/3 meters tall, open sun, ray flowers yellow, disc flowers orange-yellow. February 3, 1974. R.M.King 6681 (Holotype US); Azuay: Banos near Cuenca, Elev. 2600 meters, July 18, 1939. Penland & Summers

1067 (US).

The new species is most closely related to Calea huigrensis Blake, also of Ecuador. The Blake species, from the region of Chimborazo, differs by the entire margins of the leaves and the mearly scabrellous rather than hirsute undersurfaces of the leaf veins. Blake's original description cites heads with 3 rays but more recent collections seem to have mostly 5 or 6 rays. The number of rays is still less than is usual in C. kingii and the limb of the rays is only about 3 mm long. Calea jelskii Hieron. of northern Peru is also closely related but differs by the heads with narrower more coriaceous phyllaries and 3-4? rays.

The genus Calea shows great variation in habit. The more familiar type,represented by the Ecuadorian species, is shrubby with subumbellate inflorescences. In Brazil, in contrast, there are some reduced tuberous forms with single long-pedunculate heads and there are various herbs with alternate or verticillate linear leaves. The genus has seemed a likely candidate for subdivision, but a basic unity is found in the broad inner phyllaries with many parallel resin ducts, in the rounded or slightly prismatic achenes, and in the pappus of 10 or more separate lobes or awns. The corolla lobes also are usually very elongate compared with those of closely related members of the Heliantheae. In final analysis the genus Calea seems readily acceptable if it is simply expanded to include one unnatural segregate.

The genus Geissopappus Benth. shares all the basic characters of Calea except one, there are no paleae on the receptacle. Because of the lack of paleae Geissopappus was placed in the artificial tribe Helenieae by Bentham (1873) but that author did recognize the similarity of the genus to Calea. Geissopappus is typified by G. caleoides (DC.) Benth. and is essentially a new name for Schomburgkia DC. hom. illeg. Four species of very different habits are placed in the genus, including G. polycephalus Baker, a shrubby plant with herbaceous triangular-ovate leaves and numerous heads on short lateral branches, and G. gentianoides (DC.) Baker, a plant with a basal tuber, mostly subbasal coriaceous leaves and few heads on long erect peduncles. It seems obvious that the genus is unnatural. The lack of paleae also proves an unworkable character when some species of Calea are considered. Calea hymenolepis Baker has been included in that genus though it has only 1 or 2 paleae per head inside the outermost flowers. The conclusion at

this time is to reduce the genus Geissopappus to synonymy under Calea. Of the following four species only one has previously been placed in Calea.

Calea bahiensis (Mattfeld) H.Robinson, comb. nov.
Geissopappus bahiensis Mattfeld, Notizbl. Bot. Gart. Berlin 9: 390. 1925.

Calea caleoides (DC.) H.Robinson, comb. nov.
Schomburgkia caleoides DC., Prodr. 7: 294. 1838.

Calea gentianoides DC., Prodr. 5: 672. 1836.

Calea polycephala (Baker) H.Robinson, comb. nov.
Geissopappus polycephalus Baker in Mart., Fl. Bras. 6 (3): 279. 1884.

In 1931 Greenman named a new genus, Tyleropappus, from Cerro Duida in Venezuela. On the basis of pappus structure and lack of paleae Greenman correctly related the genus to Geissopappus. Examination of type material of Tyleropappus shows that it shares all the basic features of Calea except habit. A style illustrated by Greenman seems to show hairs on the shaft, but no such hairs have been seen under the microscope. It is the habit that seems to provide a basis for continuing to recognize the genus Tyleropappus. Calea has mostly opposite leaves with a few species such as C. hymenolepis having alternate leaves, but none have the leaves in a dense spiral like those of Tyleropappus.

One other genus, Brasilia Barroso, is in the close relationship of Calea. Habit and most features of Brasilia are as in typical Calea, but the pappus is distinctly different, having the segments fused into a basal tube that is densely hispid on the outer surface. Examination of specimens and photographs shows that the single species, B. sickii Barroso, is the same as Eupatorium robustum Glaziou, n.sp.?, Bull. Soc. Bot. Fr. lvi. mém. 3: 384. 1909. Names in the Glaziou list are usually treated as nom. nud. and it seems best to continue the practice for this question-marked name.

Acknowledgement

The R.M.King collection from Ecuador was collected during field work supported by the National Geo-

graphic Society.

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Calea kingii H.Robinson, Holotype, United States National Herbarium. Photo by Victor E. Krantz, Staff Photographer, National Museum of Natiral History.

Calea kingii H.Robinson, enlargement of heads.

A NEW NAME FOR THE MOSS GENUS, *THYRIDIUM*

Harold Robinson
Department of Botany
Smithsonian Institution, Washington, D.C. 20560.

The name *Thyridium* Mitten has been used for more than a hundred years for a distinctive moss genus in the family Calymperaceae. It now appears that the same name has been in use for a genus of fungi. The recent publication by Holm (1975) shows that the valid publication of the fungus genus *Thyridium* is previous to that of the moss. The fact that the fungus name is in active use seems to preclude any possibility of conservation for the moss genus. There is no extant alternate name available for the moss genus and the following new genus name and new combinations are provided here.

Mitthyridium H.Robinson, nom. nov. for *Thyridium* Mitten, J. Linn. Soc., Bot. 10: 188. 1868. not *Thyridium* Nitschke, Pyr. Germ. 110. 1867. Lectotype species, present designation: *Syrrhopodon fasciculatus* Hook. & Grev.

The genus contains the following 35 species.

Mitthyridium adpressum (Broth.) H.Robinson, comb. nov.
Syrrhopodon adpressus Broth., Oefv. Finsk. Vet. Soc. Foerh. 40: 166. 1898.

Mitthyridium binsteadii (Thér. & Dix.) H.Robinson, comb. nov.
Syrrhopodon binsteadii Thér. & Dix., J. Linn. Soc., Bot. 43: 302. 1916.

Mitthyridium cardotii (Fleisch.) H.Robinson, comb. nov.
Thyridium cardotii Fleisch., Musci Fl. Buitenzorg 1: 220. 1904.

Mitthyridium chenagonii (Ren. & Card.) H.Robinson, comb. nov.
Syrrhopodon chenagonii Ren. & Card., Bull. Soc. Roy. Bot. 29 (1): 175. 1890.

Mitthyridium constrictum (Sull.) H.Robinson, comb. nov.
Calymperes constrictum Sull., U.S. Expl. Exp. Wilkes Musci 6. 3A. 1859.

Mitthyridium crassum (Broth.) H.Robinson, comb. nov.
Syrrhopodon crassus Broth., Oefv. Finsk. Vet. Soc. Foerh. 40: 166. 1898.

Mitthyridium cuspidatum (Fleisch.) H.Robinson, comb. nov.
Thyridium cuspidatum Fleisch., Musci Fl. Buitenzorg 1: 235. 1904. [Syrrhopodon cuspidatus Besch., 1901 nom. nud.].

Mitthyridium cyrtophyllum (Besch.) H.Robinson, comb. nov.
Syrrhopodon cyrtophyllus Besch., Ann. Sc. Nat. Bot. ser. 6, 9: 347. 1880.

Mitthyridium fasciculatum (Hook. & Grev.) H.Robinson, comb. nov.
Syrrhopodon fasciculatus Hook. & Grev., Edinburgh J. Sci. 3: 225. 1825.

Mitthyridium flavum (C.Müll.) H.Robinson, comb. nov.
Syrrhopodon flavus C.Müll., Bot. Zeit. 13: 763. 1855.

Mitthyridium fleischeri (W.Schultze-Motel) H.Robinson, comb. nov.
Thyridium fleischeri W.Schultze-Motel, Willdenowia 7: 366. 1974.

Mitthyridium geheebii (Par.) H.Robinson, comb. nov.
Syrrhopodon geheebii Par., Ind. Bryol. 1248. 1898. [Syrrhopodon gracilis Geh., 1889 hom. illeg.].

Mitthyridium glaucinum (Besch.) H.Robinson, comb. nov.
Syrrhopodon glaucinus Besch., Bull. Soc. Bot. France 48: 14. 1901.

Mitthyridium jungquilianum (Mitt.) H.Robinson, comb. nov.
Syrrhopodon jungquilianus Mitt. in Doz. & Molk., Bryol. Jav. 1: 57. 1856.

Mitthyridium letestui (Thér. & P.Varde) H.Robinson, comb. nov.
Thyridium letestui Thér. & P.Varde, Bull. Soc. Bot. France 72: 353. 1925.

Mitthyridium leucoloma (C.Müll.) H.Robinson, comb. nov.
Syrrhopodon leucoloma C.Müll., Bot. Jahrb. 5: 86. 1883.

Mitthyridium luteum (Mitt.) H.Robinson, comb. nov.
Thyridium luteum Mitt., J. Linn. Soc., Bot. 10: 188. 1868.

Mitthyridium manii (Fleisch.) H.Robinson, comb. nov.
Thyridium manii Fleisch., Musci Fl. Buitenzorg 1: 235. 1904. [Syrrhopodon manii C.Müll., 1898 nom. nud.].

Mitthyridium megamorphum (Fleisch.) H.Robinson, comb. nov.
Thyridium megamorphum Fleisch., Bot. Jahrb. 55: 30. 1917.

Mitthyridium micro-undulatum (Dix.) H.Robinson, comb. nov.
Syrrhopodon micro-undulatus Dix., Ann. Bryol. 2: 7. 1929.

Mitthyridium obtusifolium (Lindb.) H.Robinson, comb. nov.
Syrrhopodon obtusifolius Lindb., Oefv. K. Vet. Ak. Foerh. 21: 605. 1865.

Mitthyridium papuanum (Broth.) H.Robinson, comb. nov.
Syrrhopodon papuanus Broth., Oefv. Finsk. Vet. Soc. Foerh. 37: 156. 1895.

Mitthyridium parvifolium (Bartr.) H.Robinson, comb. nov.
Thyridium parvifolium Bartr., J. Washington Acad. Sci. 46: 393. 1956.

Mitthyridium parvulum (Jaeg.) H.Robinson, comb. nov.
Thyridium parvulum Jaeg., Ber. St. Gall. Naturw. Ges. 1877-1878: 415. 1880 (Ad. 2: 679) [Syrrhopon parvulus Thwait. & Mitt., 1873 hom. illeg.].

Mitthyridium perundulatum (Broth.) H.Robinson, comb. nov.
Syrrhopodon perundulatus Broth. in Schum. & Lauterb., Fl. Deutsch. Schutzgeb. Südsee 83. 1900.

Mitthyridium pungens (Dix.) H.Robinson, comb. nov.
Syrrhopodon pungens Dix., Bull. Torrey Bot. Club 51: 231. 1924.

Mitthyridium repens (Harv.) H.Robinson, comb. nov.
Syrrhopodon repens Harv. in Hook., Icon. Pl. Rar. 1: 22. 1836.

Mitthyridium samoanum (W.Schultze-Motel) H.Robinson, comb. nov.
Thyridium samoanum W.Schultze-Motel, Willdenowia 7: 367. 1974.

Mitthyridium subfasciculatum (Hampe) H.Robinson, comb. nov.
Codonoblepharon subfasciculatum Hampe, Linnaea 40: 303. 1876.

Mitthyridium subflavum (Ren. & Card.) H.Robinson, comb. nov.
Syrrhopodon subflavus Ren. & Card., Bull. Soc. Roy. Bot. Belg. 35 (1): 310. 1897.

Mitthyridium subobtusifolium (Broth. & Par.) H.Robinson, comb. nov. Syrrhopodon subobtusifolius Broth. & Par., Oefv. Finsk. Vet. Soc. Foerh. 53A (11): 13. 1910.

Mitthyridium undulatulum (Broth. & Geh.) H.Robinson, comb. nov.
Syrrhopodon undulatulus Broth. & Geh., Oefv. Finsk. Vet. Soc. Foerh. 42: 96. 1900.

Mitthyridium undulatum (Doz. & Molk.) H.Robinson, comb. nov.
Codonoblepharum undulatum Doz. & Molk., Ann. Sc. Nat. Bot. ser. 3, 2: 301. 1844.

Mitthyridium vriesei (Lac.) H.Robinson, comb. nov.
Syrrhopodon vriesei Lac., Nat. Verh. K. Ak. Wetensch. Amsterdam 13: 6. 1872.

Mitthyridium wallisii (C.Müll.) H.Robinson, comb. nov.
Syrrhopodon wallisii C.Müll., Linnaea 38: 555. 1874.

Literature Cited

Holm, L. 1975. Nomenclatural notes on Pyrenomycetes. Taxon 24 (4): 475-488.

ADDITIONAL NOTES ON THE GENUS AVICENNIA. VI

Harold N. Moldenke

AVICENNIA L.

Additional & emended bibliography: Ernould, Mém. Acad. Roy. Belg. Cl. Scienc., ser. 2, 6: [3], 5, 7, 8, 10, 12, 24--29, & fig. 15--17, 30, 37, 38, 40, 42, & 43. 1921; Zahran, Bull. Inst. Désert Egypt. 15: 7--12. 1967; Täckholm & Boulos, Suppl. Notes Stud. Fl. Egypt [Publ. Cairo Univ. Herb. 5:] 8. 1974; Moldenke, Phytologia 32: 343--370. 1975.

It is worth noting that Täckholm & Boulos (1974) also accept the Avicenniaceae as a distinct family. Their work, cited above, bears the date "1972" on the title-page, but was not actually published until 1974.

AVICENNIA AFRICANA P. Beauv.

Additional bibliography: Erdtman, Pollen Morph. & Pl. Tax., ed. 3, 448. 1971; J. & E. Kohlmeyer, Mycologia 63: 851. 1971; Bazilovskaya, Restit. Resur. 8: 348. 1972; Letouzey, Man. Bot. Forest. Afr. Trop. 2 (B): 362 & 364. 1972; Moldenke, Phytologia 23: 419. 1972; Rouleau, Taxon Index Vol. 1-20 part 1: 42. 1972; "M. D. S.", Biol. Abstr. 56: 6077. 1973; Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 152--154. 1973; Sowunmi, Grana 13: 149 & [187]. 1973; Villiers in Aubrév. & Leroy, Fl. Gabon 22: 64--67, pl. 16. 1973; Villiers, Ann. Fac. Sci. Cameroun 14: 3--45. 1973; Farnsworth, Pharmacog. Titles 9 (3): iii. 1974; "J. S. J.", Biol. Abstr. 58: 3271. 1974; Moldenke, Phytologia 32: 361 & 370. 1975.

Additional & emended illustrations: P. Beauv., Fl. Oware 1: pl. 47 [in color]. 1806; Irvine, Pl. Gold Coast. opp. lviii. 1930; Aubrév., Fl. For. Cot. Iv., ed. 2, 3: pl. 338. 1959; Hepper in Hutch. & Dalz., Fl. W. Trop. Afr., ed. 2, 2: 449, fig. 309. 1963; Giglioli & King, Journ. Appl. Ecol. 3: 4, 13, & opp. 2. 1966; Letouzey, Man. Bot. Forest. Afr. Trop. 2 (B): 364. 1972; Villiers in Aubrév. & Leroy, Fl. Gabon 22: 65, pl. 16. 1973.

Recent collectors describe this plant as a tree or shrub, 2--22 m. tall, with numerous pneumatophores, which, according to Jenik (1967) are exactly similar to those seen in Laguncularia racemosa Gaertn. The corollas are said to have been "white with yellow center" on Morton A.494, while Irvine (1961) describes them as "dull-white, thin purplish stripes inside". Other collectors say "corolla-lobes white, pubescent inside". Irvine (1961) reports that the flowers are "bird-pollinated". This is interesting because the American species, great nectar-producers, are obviously insect-pollinated.

Avicennia africana has been collected in anthesis from September to July and in fruit in January and April. Sowunmi (1973) describes the pollen, on the basis of "Ikorodu 1966. Okafor and Macaulay, FHI", as follows: "Pollen grains isopolar, radially sym-

metrical; 3-colporate; peritreme-subprolate (P 31.2 ± 0.4 μm, E 25.2 ± 2.0 μm). Sexine subtectate, reticulate. NPC: 345. Colpi provided with granulate membranes which often protrude very conspicuously beyond the surface of the grain, especially after acetolysis. Apocolpium diameter 6.8 μm. Ora more or less circular, faintly delimited. (The apertures in this species could not be measured as they were not well displayed). Exine 1.6 μm thick, tapering towards the apertures. Sexine reticulate. Muri 0.5 μm wide, supported generally by one, but sometimes by two rows of bacula. Lumina 1.0 μm wide. Tectal part of muri 0.5 ± 0.1 μm, infratectal baculate zone 0.6 ± 0.2 μm thick, some bacula appear to be branched apically, and foot layer 0.5 ± 0.1 μm thick. Erdtman (1952, 1966) referred to the pollen as being (2-)-3 colporoidate, sexine reticulate. No 2-colporoidate grains have been observed by the present author. Such grains probably occur only rarely and might have been missed. The conspicuously protruding colpal membranes were not mentioned in Erdtman's (ibid.) short description."

It is worth noting here that the leaves on Berhaut 6418 are extremely large, while those on Compère 1834 and Dalziel 970 are remarkably small.

The original Palisot de Beauvois reference in the bibliography of this species is often cited as "1805" or "1809", but the actual date of publication seems to have been 1806.

Avicennia africana is very widely regarded as being the same species as the Avicennia found so abundantly in the New World, whether this be called A. nitida Jacq. or A. germinans (L.) L. Among the authors to so regard it may be mentioned Dalziel (1937) Roberty (1954), and Gibson (1970). Clarke (1885) notes that "Mr. Bentham considers the American and African A. tomentosa not specifically distinct". Hooker & Bentham (1849), while using the name, A. africana, comment that it is "Probably not distinct from the American A. nitida Jacq." Kohlmeyer, in a personal communication to me, informs me that two species of fungi endemic to the pneumatophores of Avicennia occur on both the west African and the American hosts and suggests that this may also point to the conspecificity of the hosts. The Kohlmeyers (1971) record Rhabdospora avicenniae from A. africana. Kuntze (1891) reduces what he refers to as "A. africana Beauv. non Schauer" to the synonymy of A. germinans.

Among the botanists, however, who have maintained A. africana as distinct may be mentioned Palisot de Beauvois (1804), Baker (1900), deWildeman (1923), Irvine (1961), Erdtman (1962), Keay (1963), Hepper (1963, 1973), Chapman (1970), Bazilovskaya (1972), Letouzey (1972), and Sowunmi (1973). Considering the great importance which many modern botanists attach to pollen morphology as an indication of taxonomic relationship, it is interesting to note that Erdtman (1952, 1966, 1971) describes the pollen-grains of A. africana as 32 x 26 mu and the reticulate sexine as thick as

the nexine, while in A. germinans they are 39 x 29 mu and the reticulate sexine is considerably thicker than the nexine. Unfortunately, I do not know what herbarium specimens he used as the basis for his A. germinans description, nor do I know exactly where in its supposed range Kohlmeyer secured the material on which his fungi grew. It is quite obvious to me that the west African plant is not identical with the true A. germinans as this occurs in southern Florida and the more northern portions of the West Indies nor with the northern South American A. germinans var. cumanensis (H.B.K.) Moldenke. Nor do I think it conspecific with A. elliptica Thunb. or its var. martii Moldenke of northeastern South America. It could, however, prove to be the same as, or, if the pollen is actually different, very closely related to or derived from A. germinans var. guayaquilensis (H.B.K.) Moldenke or A. tonduzii Moldenke of northern and northeastern South America and southern Central America.

Hooker & Bentham (1849) give the overall distribution of A. africana as "Senegal to Bonin"; Irvine (1961) says "Senegambia to Gaboon and B. Congo"; while Hepper (1963) asserts that the species "extends along the coast of western Africa to Cabinda and Longo; also in S. Tomé". Berhaut (1967) records it from Diable Island, Sénégal. Naurois (1965) discovered it on Tidre Island off the coast of Mauritania at 19°50' N., the most northerly position known for the species.

Giglioli & King (1966) have studied the connection between this plant and the malaria vector, Anopheles melas. The insect breeds in these mangrove swamps during the long dry season in Gambia. These swamps are flooded by the spring tides only. The soils have high salinity. The haloseral succession appears to begin with the colonization of fresh alluvium by Rhizophora racemosa which is replaced, in time, by Avicennia africana. With further accretion of soil, this species eventually dies out, leaving the large barren flats which are so typical of the region. Avicennia, they note, has a greater ability to take up and excrete salts than most mangrove swamp plants.

Irvine (1930) says that in Ghana (Gold Coast) A. africana grows in association with Sesuvium portulacastrum, that the bark yields tannin employed in tanning leather, and that the wood is used as firewood and, when in sufficient abundance, for building. "The wood stands well under water". He reports that "The tree grows in communities in the shallow lagoons near the sea. It is one of the tallest trees in the Mangrove association....and may reach 40 feet in height." His description of the tree is of special interest: "roots sticking up from the mud of lagoons in great numbers, probably for breathing purposes, also slender stilt-roots near the base of the trunk." This is the first reference in literature (known to me) of the occurrence of stilt-roots in the Avicenniaceae. In this connection, see my following discussion under A. alba Blume and the photograph there reproduced.

Villiers (1973) studied a mangrove swamp in the north littoral region of Gabon which is characterized by an outcropping rocky substratum over most of its surface. The vegetation here is noteworthy because of the absence of the normal association zones and has a mosaic appearance. Associated with Avicennia africana are Acrostichum aureum, Phymatodes scolopendria, Philoxerus vermicularis, Conocarpus erectus, Laguncularia racemosa, Rhizophora spp., Dalbergia ecastophyllum, Ormocarpum verrucosum, Loranthus sp., Flagellaria guineensis, Asparagus warneckei, Phoenix reclinata, Pandanus candelabrum, Fimbristylis spp., Eleocharis geniculata, Paspalum vaginatum, and Bulbophyllum sp. Th abundance of New World species in this assemblage is worthy of note.

Chapman (1970) proposes the ecologic association, Avicennietum africanum. Hansford (1961) records the fungus, Asteridiella sepulta (Pat.) Hansf. [Meliola sepulta Pat., Irene sepulta (Pat.) Toro, Irenina sepulta (Pat.) Stevens] from Avicennia africana as host in Sierra Leone, based on Deighton 358.

Avicennia africana is variously employed by natives in the lands where it occurs, as we have noted previously. Villiers (1973) says: "Le bois dur et blanc est utilisé comme combustible et pour la fabrication des poteaux de cases ou des membranures des embarcations. La poudre de l'écorce entre dans la composition d'une pommade à base d'huile de palme contre la galle, les poux et les chiques. L'écorce sort au tannage. Les graines sont mangées en cas de famine (mais une longue préparation est nécessaire pour les rendre comestibles)." This statement is repeated for the natives of Sénégal by Chevalier (1931) in at least most of its details. Bazilovskaya (1972) reports the plant is "important" to the native economy of Guinea. Dalziel (1937) asserts that "The sapwood is white, the heart light brown, darkening, fairly hard and durable, said to be termite-proof. It is used on the coast for boat and house-building, piles, wharves, gun-stocks, etc. It yields firewood, and charcoal for fish ovens, and is used in the Niger Delta to prepare salt, chiefly from the leaves and roots; the salt.....is better than that from other mangroves.....It is also said to be used as a red dye. The bark is used to treat parasitic skin diseases, itch, etc. In western Senegal some island people are said to use the germinating seeds of Avicennia as a famine food, but these, when uncooked or improperly prepared, are actually poisonous." Irvine (1961) repeats practically the same information, adding that the wood is used for furniture (e.g. chair-legs) and the bark yields 12.5 percent tannin, used to tan leather. He notes that "The dry pulverized bark in warm water is used as a paste for parasitic skin diseases, itch, and dermatitis. The pulverized bark, with palm-oil, is made into an ointment which is used in Fr. Equat. Africa for itch, lice, and 'flesh worms' (Abbé Walker). The leaves are said to be used as an enema in Liberia for piles."

In addition to the many vernacular names for this plant previously recorded by me (1960, 1970) the following are also reported:

"aguirigui", "aligiri", "aligitsi", "bakèlè", "balumbu", "benga", "béséki", "bu hek", "bukélék", "buran", "burhan", "chrodo", "diligitsi", "dilitsi", "diubukumô", "egirigi", "élowè", "fang du Como", "fang du Rio Muni", "ibuâdé", "igiri", "loango", "mangle boton", "mbagé", "maglé", "mbuan", "mbugâd", "mbugan", "mbugând", "mbhurhan", "mpongwè", "mugiri", "muandi", "ndar", "ngowè", "nkomi", "olive mangrove", "orungu", "paletuvier blanc", and "sanar". Some of these names are applied also to other mangrove species in the area not differentiated by the natives.

Bentham & Hooker (1849) cite unnumbered Vogel collections from Grand Bassa and Cape Palmas. Baker (1900), Dalziel (1937), Irvine (1930, 1961), and Villiers (1973) together cite the following collections: SÉNÉGAL: Baldwin 5753; Chevalier 2759 & 2760; Döllinger 73, in part; Roger 75; Unwin 397. GAMBIA: Fox 106; Frith 34; Pitt 693; Ruxton s.n. PORTUGUESE GUINEA: Esp. Santo 1219. REPUBLIC OF GUINEA: Debeaux s.n. SIERRA LEONE: Don 168 & s.n.; Glanville 246; T. S. Jones 410; Lane-Poole 320; Mann vii; Scott-Elliot 4120; Thomas 7070. TURTLE ISLANDS: Deighton 2362. ST. LOUIS ISLAND: Brunner 1; Döllinger 73, in part. JAFAL ISLAND: Leprieur s.n. LIBERIA: Dinklage 1910; T. Vogel 101 & s.n.; Whyte s.n. BUSHROD ISLAND: Baldwin 13050. IVORY COAST: Chevalier 19908. GHANA: Andoh 5604; Chipp 175; Deakin 24; deWit & Morton A.2971; Foggie 4942; Irvine 754; Johnson 984; Morton A.494. TOGO: Warnecke 63. NIGERIA: Southern: Barter 46; MacGregor 341; Rosvear 16; Rowland s.n.; Talbot s.n.; Unwin 56; Vogel 101. CAMEROONS: Bates 195; Maitland 30. FERNANDO PO: Mann 231; Milne s.n. GABON: Chevalier 4343, 26815, & 27142; Debeaux 102; Dupanquet s.n.; Dybowski 170; Griffon du Bellay s.n.; Hallé N.1551; Klaine 85 & 1836; Leroy s. n.; Pobéquin 7; Thollon 138, 208, & 638; Villiers 8, 23, 89, 143, & 262. PORTUGUESE CONGO: Soyaux 60. ZAIRE: Dupuis s.n. ANGOLA: Welwitsch 5641, 5709, & 5726.

Additional citations: SÉNÉGAL: J. T. Baldwin 5753 (W--2070037); Berhaut 6418 (Mu). LIBERIAN ISLANDS: Bushrod: J. T. Baldwin 13050 (N, W--2672582). IVORY COAST: F. R. Fosberg 40637 (W--2580423A). GHANA: J. K. Morton A.494 (Ba); Vigne 353 (W--1758635). NIGERIA: Southern: Dalziel 970 (Mu). GABON: Bogner 611 (Mu). ZAIRE: Compère 1834 (Mu); Wagemans 587 (Mu).

AVICENNIA ALBA Blume

Additional & emended synonymy: Avicennia officinalis Kurz apud C. B. Clarke in Hook. f., Fl. Brit. India 4: 604, in syn. 1885 [not A. officinalis L., 1753, nor Maxim., 1932, nor Millsp., 1930, nor Schau., 1856]. Avicennia alba Miq. ex Kuntze, Rev. Gen. Pl. 2: 502, in syn. 1891 [not A. alba Karst., 1907, nor Wight, 1921]. Avicennia officinalis Watt apud Cooke, Fl. Presid. Bomb., ed. 2, imp. 1, 517, in syn. 1958. Avicennia officinalis var. alba (Bl.) Hook. ex Jafri, Fl. Karachi 290, in syn. 1966.

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The illustration labeled as A. alba by Jafri (1966) is actually a depiction of A. marina var. acutissima Stapf & Moldenke and the

plant which he describes as being very common in the Karachi area of Pakistan is also A. marina var. acutissima. The true A. alba is not known from present Pakistan (but does occur in what is now Bangladesh). The A. resinifera of Griffith (1854), on the other hand, actually is A. alba. The illustration given by Meijer (1968) as A. alba actually depicts A. marina var. rumphiana (H. Hallier) Bakh.

It should also be noted here that Blume's original description of A. alba is often cited as "1825", but was not actually published until 1826.

It is also worth noting here that the "A. tomentosa Roxb." is usually regarded as a synonym of A. officinalis L., but Kurz (1877) maintains it as a taxon different and distinct from A. officinalis. He and some other authors who use this homonym probably are referring to A. alba. The reference, "Rheed. 4. t. 45", is sometimes cited for A. alba, but I am unable to find any such illustration of A. alba in the works of Reede tot Drakestein.

Corner & Watanabe (1969) describe A. alba as a "Mangrove tree with peg-like pneumatophores. Leaf dark green above, silvery grey beneath. Flowers 4--5 mm. wide, in spikes, yellow". Recent collectors describe it as a gregarious shrub or tree at water fringes, 15--70 feet tall, the trunk 1--5 feet in girth, with aerial roots above the water surface, the bark surface subject to tide action black and rough, above tide action gray or pinkish-gray and smooth or dark glaucous-brown, lenticellate, the lenticels small, the soft wood whitish, the leaves glaucous beneath, the inflorescence indeterminate, in spike-heads, the peduncles brown-tomentose, the flowers fragrant, the calyx green, the petals 4, the stamens 4, alternating with the petals, the filaments short, orange-yellow, the anthers cream-colored or darker colored and turning black, the pistil very light-yellow, the stigma bifid, and the fruit glaucous-green, the sutures on both sides of the pericarp purplish. The corollas are said to have been "orange" in color on Orolfo 690, "orange-yellow" on Chai S.26764, S.27535, & S.29944, and "yellow" on Chai S.30626. Chai S.29936 exhibits some leaves like those of var. latifolia Moldenke on the same branch with typical ones. Wood vouchers accompany R. M. King 5588 & 5601 and Chai S.26764 & S.30667. The species has been found in flower from March to June, as well as in August, December, and January.

Raghaven & Arora (1958) and Cave (1959) report the haploid chromosome number as 33 and the diploid number as 66, but Löve (1968) reports n = 30, based on Ghosh E.331 from Jambu Island, Orissa, India. An additional vernacular name reported (besides those previously reported by me) is "báen". A very detailed description of the wood anatomy is given by Janssonius (1926).

Burkill (1966) calls the species "A tree attaining, not infrequently, a height of 70 feet, and sometimes more, which likes rich soil and takes possession of newly formed mud-banks, generally where it obtains a good deal of fresh water from a river flowing to the

sea past it; inland it occurs on the banks of such a river. Outside of Malaya, it extends from India to Polynesia."

Fig. 1. A. alba, showing trunk and pneumatophores

My good friend, Paul Chai, in a letter to me dated May 25, 1973, asserts that "I found in Sarawak that some individuals of all three species (A. alba, A. marina and A. officinalis) occurring here possess stilt roots. These individuals were found to be confined to soft muddy soil.....Unlike the stilt roots of Rhizophora, stilt roots of Avicennia are more slender and soft. They arise in the same way as aerial roots which extend and reach the mud eventually." To see examples of this condition, see the figure 5 here and the similar figure to be presented in my discussion of A. marina. These are probably the "aerial roots above the water level" referred to by some collectors. I am grateful to Paul Chai for his permission to use the photographs here presented, in all cases depicting trees growing in Sarawak.

Gaussen and his associates (1965) refer to A. alba as a "colonizer on mangrove deltas". Chandhri (1961) reports that it "secretes hygroscopic salts which have the ability to absorb water from the

Fig. 2. A. alba forest with Sonneratia alba in foreground

atmosphere and so replenishes its water supply during the night and cooler parts of the day when the relative humidity is high; it grows in pure mangrove forests in protected creeks and the mouths of rivers in shallow seas". Chapman (1970) proposes the ecologic associations Avicennietum album and Avicennieto albae - A. marinae.

Stone (1970) gives a good description of this species as it occurs in Guam: "A tree (ours rather small) of the saline and seaward margin of mangrove swamps; leaves oblong-elliptic or lanceolate, acute or rarely obtuse, acute at base, medium or olive green above, white beneath, 3—16 cm. long, 1.5—5 cm. wide; flowers 10—30 per spike, yellow, paired, spikes 2—3 cm. long; corolla 4—7 mm. long, 5—8 mm. wide; stamens 1.5—2 mm. long; style obsolete; stigma e-

rect; ovary short-puberulent distally; fruit floating". He gives its overall distribution as "Malaysia and adjacent Pacific islands" and comments that in Guam it is "Common in the Apa mangrove areas, apparently absent elsewhere.....associated with Rhizophora and Bruguiera. The corolla is dark yellow — nearly orange. A pioneer species, its seedlings often standing out to sea in suitable locations, but like all mangroves absent on surf-swept rocky or sandy coasts." Gaussen and his associates refer to it as a "colonizer of intertidal zones and estuaries".

Fig. 3. A. alba forest

Navalkar found that in the Indus delta and the Sundribans delta, India-Bangladesh, the mangrove succession is governed by the disintegration of rock, soil salinity, soil humidity, and biotic factors. He recognized the following seven stages in the succession: (1) Avicennia alba Association (Optimum Stage); (2) Avicennia alba and Acanthus ilicifolius Stage. In these two stages the soil is blackish or grayish, composed of clay and salt, is always inundated and swampy, lying between low and high tide marks. (2a) Ceriops candolleana and Acanthus ilicifolius Stage, marked by cutting and burning by man; high level of ground water mingles with creek water; there are areas where sweet water mingles with creek water. (3) Avicennia alba Stage, at a greater distance from shore and weathered rocks; marked by an increase in anthropozoic biotic factors. (4) Sesuvium portulacastrum Stage, at a still greater distance from the shore. (5) Sesuvium portulacastrum and Aeluropus repens Stage, with an increase in height above the sea level and decreasing salinity. (6) Aeluropus repens and Paspalum vagin-

atum Stage, with still greater increase in height above sea level and decreasing salinity. (7) Clerodendrum inerme Stage, with increasing aridity and very little salinity.

Fig. 4. A. alba trees

Puri & Jain (1957) have studied the mangrove vegetation in the Poona region on the west coast of India and have recognized there a number of plant communities that are really edaphic or bio-edaphic in nature. Puri found that in the mangrove associations of the Indus delta there are 279 species of plants in 184 genera and 61 families, while in the Sundribans delta there are 304 species in 230 genera and 72 families.

Richards (1964) affirms that "In Malaya the pioneers [in the mangrove association] are not species of Rhizophora [as they are in the New World], but Avicennia alba and A. intermedia, or sometimes, on deep mud rich in organic matter, Sonneratia griffithii. These pioneer forests establish themselves on shoals or sandbanks out at sea

which are exposed at neap tides, or along the seaward edge of existing forests. Avicennia intermedia grows on a comparatively firm

Fig. 5. Avicennia alba, showing stilt-roots. [Fig. 1--5 photographs by Paul Chai, Office of the Conservator of Forests, Sarawak, taken September 14, 1971, June 29, 1973, August 11, 1973, and October 16, 1974]

clayey substratum which is easy to walk on, A. alba and Sonneratia on softer and blacker mud. On the clay soils the Avicennia is normally succeeded by Bruguiera caryophylloides, but where Sonneratia is the pioneer, Rhizophora mucronata usually follows on..... The east coast of Sumatra, according to Troll & Dragendorf (1931), is fringed with an almost unbroken mangrove belt which in places is several kilometers wide. The dominant species in the pioneer zone is Avicennia alba, often associated with Sonneratia alba. Further inland these give way to species of Rhizophora, Bruguiera, Xylocarpus, etc. and at the landward edge of the swamps there is generally a zone of the palm Nipa fruticans with which Sonneratia acida is often associated......On the Malayan coasts.....[the].... species growing on land flooded by 'medium high tides' [are] Avicennia alba, A. intermedia, Sonneratia griffithii and, on river banks, Rhizophora mucronata."

Chai (1972) reports that in Sarawak Sonneratia alba is "A pioneer species colonising newly formed mud flats along sheltered sea shores and estuaries. Avicennia alba may also come in at the same time or immediately after." Avicennia alba, he says, is a "Small to huge tree —70 ft. tall and 7 ft. girth. Bark dark brown to black. Not buttressed but may develop slender, soft stilt roots. Leaf lanceolate or elliptic-obovate with tapering base; lower leaf surface whitish, salt being excreted from this surface. Fruit glaucous, green, leech-shaped. Occurrence. Another pioneed species colonising newly formed mud flats as Sonneratia alba. Often gregarious along low convex banks of the rivers near the sea but is later replaced by Rhizophora apiculata and Bruguiera parviflora. Rare inland." He says that it grows in Watson's Inundation Class 2 — inundated by medium high tides (flooded 45 to 59 times per month). A. marina normally grows in this same inundation class in Sarawak, but A. officinalis grows only in Class 3, inundated by normal high tides only (flooded 20 to 45 times per month).

Navalkar (1961) asserts that "From the point of exchangeable bases, which are far more important in determining associations than the pH, $CaCO_3$, humus etc., three different types of soils have been distinguished so far as the mangroves of the Western coast of India are concerned, particularly for Bombay and Salsette Islands and the surrounding area. Each type of soil is characterised by its own peculiar flora as : (a) Ca-Mg soil with Avicennia alba as the dominant plant to the extend of excluding competitors; (b) Ca-Na soil characterised by Acanthus ilicifolius vegetation is almost in pure stage; (c) Ca-K soil characterised by Suaeda fruticosa vegetation and a few associated plants. The high osmotic pressure in the cell sap of the leaves of Avicennia alba Bl. due to higher chloride content than in any other mangrove species, may account for the dominance of Avicennia alba near the foreshores of Bombay and Salsette Islands."

Navalkar (1940) has found that osmotic pressure of this man-

grove's cell sap varies directly with tide and temperature and inversely with humidity and rainfall. Its physiological anatomy has been studied and reported on by Mullan (1932).

Puri (1960) reports that Navalkar found an osmotic pressure in Avicennia alba of 38.607 atmospheres, while Sen Gupta found it to be 41.29 atmospheres. He found the species' geographic distribution in India to be confined to the East Coast (like A. marina), in contradistinction to A. officinalis which he found on both the West and East Coasts, the Indus delta, the Sundribans, Chittagong, Burma, and the Andaman Islands. In the "Low mangrove forest" it grows in association with Ceriops roxburghiana, Aegialitis rotundifolia, and Excoecaria agallocha, while in the "Tree mangrove forest" on the river deltas of the East Coast it grows with Rhizophora conjugata, Kandelia rheedii, Bruguiera gymnorhiza, Carapa moluccensis, Ceriops candolleana, etc.

Ten & Keng (1969) assert that "A. intermedia was suggested to be a natural hybrid of A. alba and A. officinalis, by Griffith (cf. Ridley, 1923). However, seedlings of this species are uniform, and do not reveal any hybrid nature. Although the pollen grains exhibit intermediate characters between A. alba and A. officinalis, they are mostly well-filled, rather than empty, thus suggesting that it is a distinct species." I regard it as A. marina (Forsk.) Vierh., although perhaps a small-leaved form worthy of varietal or form rank.

Backer & Bakhuizen van den Brink (1965) differentiate A. alba from A. marina as follows: A. alba — "Flowers in 10—3-flowered spikes; flower-pairs, at least in the lower part of the spike, conspicuously distant; adult spikes 1 1/2 — 3 cm long; style absent or very short (1/4 — 1 1/2 mm); stigmas erect during anthesis. Leaves oblong or lanceolate, rarely elliptic, from an acute, rarely broadly cuneate base, with an acute, rarely obtuse tip, white beneath, 3—16 cm by 1 1/2 — 5 cm." A. marina — "Flowers in 2—12-flowered heads; lowermost flower pair sometimes distant from the other ones, but nevertheless the inflorescence not spiciform; adult heads 1/2 — 1 1/2 cm long; style robust, c. 1 1/2 mm long; stigmas recurved. Leaves elliptic-oblong or oblong-obovate, from an acute base, with an obtuse or rounded tip, greenish white beneath, 3—9 cm by 1 1/4 — 4 1/2 cm."

Both of these species are distinguished by having the "Expanded flowers 5—8 mm across; corolla from the base of the tube up to the tops of the segments measuring 4—7 mm; segments subequal; stamens (inclusive of anthers) 1 1/2 — 2 mm long; ovary glabrous in the lower half, in the upper half or apically densely covered with upcurved, appressed, short hairs; style short (at most 1 1/2 mm) or nearly absent; stigmatic lobes equal."

In contradistinction, A. officinalis is characterized by the "Expanded flowers 10—15 mm across; corolla from the base of the tube up to the tops of the segments measuring 7—10 mm; posterior segment broadest, shallowly bilobed; stamens (inclusive of the an-

there) 3 1/2 — 4 1/2 mm long; ovary densely appressed-pubescent throughout; style subulate, pubescent throughout or at least at base, 3—4 mm long; stigmatic lobes much shorter than the rest of the style, often unequal." It might also have been mentioned that in A. officinalis there are 5 fibrovascular bundles leading into the corolla, while the other two species have only 4.

Burk (1966) asserts that he feels Bakhuizen van den Brink was in error in reducing A. alba to varietal rank under A. marina (Forsk.) Vierh. because of the "dissimilarity of the habitat of the Red Sea plant, which is the original A. marina, on the shore of a very saline sea", while A. alba "is found away from the salt water, up creeks into which an abundance of fresh water descends.....it seems best to regard it as a species." Watson (1928) asserts that its flowers are the smallest of all the Malayan species, but the dimensions for A. marina and A. lanata Ridl. are only a trifle larger.

Shah & Patel (1970) reduce A. alba to synonymy under A. marina var. acutissima Stapf & Moldenke, but by this they doubtless mean the "A. alba" of Jafri (1966) and Stewart (1972), not of Blume.

Kuntze (1891), in proposing his new species, A. spicata Kuntze, says: "Inflorescentiae distiche spicatae, novellae longe conicae demum dissitiflorae axi villoso vix foveato. Fructus longus (1: 1 1/2 — 2) e basi ovodea acuminatus. Singapur. Hierzu A. officinalis 'S. Kurz' Fl. Burma non L., ferner A. alba Miq. p. p. und A. officinalis var. alba Clarke p. p.; non Avic. alba Blume. Weder Blume noch Clarke geben die oben beschriebenen Merkmale an und Miquel hat die 2 scharf und leicht zu unterscheidenen Arten confundirt. Im Kew Herbar fand ich diese Art von Birma (Griffith 6071), Malaya (Maingay 1209), Java (Horsfield 31), Borneo (Beccari 1770). Diese Art ist nur mit lanzettlichen unterseits weisslich schwach behaarten Blättern und entsprechenden schwach behaarten Blüthen bekannt; die Inflorenzaxis ist aussergewöhnlich behaart, rostfilzig. Ich fand die Art als Baum und Strauch, mit gelblichen Corollen; die in der Frucht entwickelten Keimblätter sind dunkelgrün mit braunbehaarter hypocotyler Axe." I have seen 3 of the 5 collections, including the type, which he cites and find them to be typical A. alba Blume.

Nakanishi (1965) has found that the flowers of Avicennia alba contain "sterols, phenolics and no alkaloids. LD_{50} was greater than 1000 mg/kg" and that the flowers exhibited activity against Bacillus subtilis and Staphylococcus aureus, but no activity against Proteus vulgaris or Escherischia coli. They showed no antitumor activity against the Yoshida sarcoma. The stems gave a positive alkaloid test and equivocal stereols and phenolic tests; they exhibited the same toxicity as the flowers and the same negative results against Yoshida sarcoma, and had the same antimicrobial activity as the flowers. The leaves gave equivocal alkaloid and sterol tests and positive tests for phenolics, showed the same toxicity as the flowers and stems and no activity against

the Yoshida sarcoma and the same antimicrobial results as the stems and flowers. Willamen & Li (1970) report the presence of an unnamed alkaloid in the leaves and stems.

Cuadra reports that wood of this species is used for firewood in Sabah. Shah (1962) and Santapau & Shah (1969) record it from Salsette Island, Santapau (1967) from Saurashtra, and Rao, Aggarwal, & Mukherjee (1963) from Ramaswaram Island, India. Prain (1908) reports finding it on riverbanks in the Sundribuns, describing it as "A shrub; leaves acute; capsules narrow". Navalkar (1956) records it from Bombay and Salsette Islands, where, he affirms, it grows in association with Ceriops candolleana and Acanthus ilicifolius. Brunig (1969) records it from Sarawak.

Sebastine & Ellis (1967) cite Sebastine 10646 from Madras, India. Bakhuizen van den Brink gives its overall distribution as from Sind to Malacca, the Malayan Archipelago, the Philippines, New Guinea, Polynesia, and China [the "Sind" record is erroneous, being based on specimens which prove to be A. marina var. acutissima]. He cites the following: INDIA: Falconer 2415. GREATER SUNDA ISLANDS: Borneo: Boschwezen 1974; Labohm 1964. Celebes: Rachmad 357; Teijsmann 13766; Van Vuuren 58. Java: Backer 1172, 1191, 1719, 1720, 1721, 1722, 2112, 2699, 7293, 21443; Hallier f. 163; Koorders 9694, 9695, 9696, 13478, 22009, 22022, 24112, & 25613; Scheffer 11. Sumatra: Gusdorf 8; Koorders 10591 & 10592; Lörzing 6029 & 7285. LESSER SUNDA ISLANDS: Bali: Becking 39. PHILIPPINE ISLANDS: Mindanao: Hutchinson 3947.

Cooke (1958) records the species from Salsette Island and from Konkan, India, citing Bhide s.n., Ganime s.n., Ryan s.n., and Stocks s.n. He gives its overall distribution, as known to him, as "India in tidal creeks; Malaya, S. E. Asia, N. Australia". Stewart (1972) records it from tidal mangrove swamps of Sind and Baluchistan, citing Jafri s.n., Stearn 19, and HB.20683, but the plant here referred to is actually A. marina var. acutissima.

On the other hand, it seems likely that the "Avicennia tomentosa Roxb." of Mukherjee & Chanda (1973) from the Sundribuns of Bengal is actually A. alba Blume.

Material of A. alba has been misidentified and distributed in some herbaria as A. marina (Forsk.) Vierh. On the other hand, the Backer 15324 and Gill 24, distributed as A. alba, are actually A. marina (Forsk.) Vierh. and Stearn 19 is A. marina var. acutissima Stapf & Moldenke.

Additional citations: INDIA: Andhra Pradesh: Thanikaimoni s.n. [Yanam, 15.3.74] (Ld). West Bengal: Prain s.n. [August 5, 1902] (Pd). BURMA: Tenasserim: Falconer 241 (Pd, Pd). THAILAND: R. M. King 5588 (W—2435842), 5601 (W—2435928). MALAYA: Malacca: W. Griffith 59 (Pd). GREATER SUNDA ISLANDS: Java: Koorders 9696 β (Pd), 22009 β (Pd). Sabah: Cuadra A.1232 (W—2187104); Orolfo 690 (W—1674491). Sarawak: Chai & al. S.26764 (Ld), S.27535 (Ac),

S.29936 (Ld), S.29944 (Ld, Z), S.30626 (Ft, Ld), S.30667 (Ld). NEW GUINEA: Papua: Gill s.n. [Port Moresby, 6 April 1970] (E—2035070).

AVICENNIA ALBA var. LATIFOLIA Moldenke

Additional bibliography: Moldenke, Phytologia 15: 71. 1967.

Recent collectors describe this plant as a shrubby tree, 20—25 feet tall, with a short bole about 5 feet tall and 6 inches in diameter at breast height, 18 inches in girth, branching low, the crown spreading, the bark greenish-gray-brown, smooth, or black and pinkish-mottled with the basal part blackish throughout, the under bark green, the inner bark cream-colored, lenticels many, small, leaves subcoriaceous, with gray matted hairs beneath, peduncles and petioles of younger leaves brown-tomentose, corollas orange-yellow, pistil greenish, fruit light-green, with a velvety surface. They have encountered it at sealevel on the edges of the mangrove association inundated only by high tides, flowering in June.

Paul Chai writes me, in a letter dated September 14, 1971, that his no. S.29946, cited below, "was collected recently. It has much broader leaves than S.27535, S.29936, S.29944 and S.30626 [=A. alba Blume]. It has lenticillate bark surface throughout the main trunk, another feature which is not found in the other four numbers. It is possible that the tree is still at a relatively younger stage. The leaf size puts it quite nicely with A. alba Bl. var. latifolia."

Material of this variety has been misidentified and distributed in some herbaria as A. marina (Forsk.) Vierh.

Additional citations: GREATER SUNDA ISLANDS: Sarawak: Chai S. 29946 (Ld, Z). NEW GUINEA: Papua: Gill s.n. [Port Moresby, 6 April 1970] (E—2034437); Havel NGF.17393 (W—2484749).

AVICENNIA BALANOPHORA Stapf & Moldenke

Additional bibliography: Moldenke, Phytologia 7: 159—160. 1960; R. Good, Geogr. Flow. Pl. 241. 1964; V. J. Chapm., Trop. Ecol. 11: 5, fig. 3. 1970.

AVICENNIA BICOLOR Standl.

Additional bibliography: Fedde & Schust. in Just, Bot. Jahresber. 53 (1): 1068. 1932; I. M. Johnst., Sargentia 8: 260. 1949; Bascope, Bernardi, Jorgensen, Hueck, Lamprecht, & Martinez E., Mangl. Am. [Inst. Forest. Latinoam. Invest. Capac. Descrip. Arb. Forest. 5:], imp. 1, 16. 1959; Moldenke, Phytologia 14: 310. 1967; Moldenke, Résumé Suppl. 16: 3. 1968; Bascope, Bernardi, Jorgensen, Hueck, Lamprecht, & Martinez E., Mangl. Am. [Inst. Forest. Latinoam. Invest. Capac. Descrip. Forest. 5:], imp. 2, 16. 1970; V. J. Chapm., Trop. Evol. 11: 5, fig. 3. 1970; Gibson, Fieldiana Bot. 24 (9): 176—177. 1970; Moldenke in Woodson, Schery, & al., Ann. Mo. Bot. Gard. 60: 150 & 154. 1973; "H. R.", Biol. Abstr. 57: 1904. 1974; Molina R., Ceiba 19: 95. 1975.

Duke says of the Avicennia population in Panama: "Holdridge and

I believe there are two species in Darién, this is a larger tree with larger leaves and more pronounced white beneath". He reports this tree to 75 feet tall, the diameter of the trunk at breast height to 14 inches, "often hollow and often with projections similar to the pencil roots", the pencil roots (pneumatophores) ranging from 2 to 5 inches in height. Other collectors refer to it as a tree, 3--13 m. tall or more, the trunk 10--30 inches in diameter, with somewhat rough brown bark, and have encountered it in mangrove swamps and along the outskirts of the tidal belt, in flower in April, August, and November to January.

Additional citations: HONDURAS: Valle: Molina R. 21457 (N). PANAMA: Darién: Duke 5488 (Ac). Casaya Island: Duke 10372 (Oh, W--1908630). PEARL ISLANDS: San José: I. M. Johnston 1259 (E--1591147, W--2024284).

AVICENNIA ELLIPTICA Holm in Thunb., Pl. Bras. Dec. 3: 37. 1821.

Synonymy: Avicennia elliptica Thunb. ex Schau. in A. DC., Prodr. 11: 700, in syn. 1847.

Bibliography: Thunb., Pl. Bras. Dec. 3: 37. 1821; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 254. 1893; Moldenke, Prelim. Alph. List Invalid Names 5. 1940; Moldenke, Alph. List Invalid Names 5. 1942; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 254. 1946; Moldenke, Résumé 235. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 254. 1960; Moldenke, Phytologia 7: 166 & 206 (1960) and 14: 328. 1967; Moldenke, Fifth Summ. 1: 392. 1971; Moldenke, Phytologia 30: 15 (1975) and 31: 383, 384, & 393. 1975.

In my publications previous to 1975 I regarded A. elliptica as a synonym of A. germinans (L.) L., as was done by some previous authors, and specimens were so annotated by me in various herbaria. It seems to me now, however, that the very long-, narrow-, and smooth-leaved population in northeastern Brazil is sufficiently distinct to warrant the resurrection of Holm's specific name for it. According to Gardner the species is "a large tree" and according to Curran it lives "in fresh water". Vasconcales Sobrinho found it in flower in July and reports the vernacular name, "mangle", for it. His photograph no. 135 shows the tree in situ. Jackson (1893) regarded it, curiously, as a synonym of the Asiatic A. officinalis L., a completely untenable disposition.

It is very probable that many of th 41 other collections cited by me in Phytologia 7: 206 (1960) and the 5 cited in Phytologia 14: 328 (1967) as A. germinans from Brazil will prove on re-examination to be A. elliptica Holm, A. elliptica var. martii Moldenke, or A. germinans var. guayaquilensis (H.B.K.) Moldenke. It is not now feasible for me to borrow back these specimens for re-examination.

Citations: BRAZIL: Bahia: Blanchet s.n. [Bahia 1832] (M). Pará: H. M. Curran 16 (F--740465, S, W--1617777). Pernambuco: G. Gardner 1101 (Bm, Cb, Cb, Ed, Ed, K, K, N, P, P, S, V, V, V, V, W--1066491), s.n. [Pernambuco, III.1837] (N); Vasconcales So-

brinho 287 [photo 135] (N, N, N--photo). State undetermined: Westin s.n. (N--photo of type, Th--type, Z--photo of type).

AVICENNIA ELLIPTICA var. MARTII Moldenke, Phytologia 30: 15. 1975.
Bibliography: Moldenke, Phytologia 7: 204--206 (1960), 14: 328 (1967), 30: 15 (1975), and 31: 383 & 384. 1975.

This variety differs from the typical form of the species in having leaves whose blades are more broadly elliptic, 7--13 cm. long (including the petiole), 2--3.5 cm. wide, and very sharply and conspicuously acute or acuminate at box the apex and base.

Lanjouw & Lindeman describe this plant as a tree or shrub with pale-yellow flowers, called "parwa" in Surinam, and found it growing on mud banks, flowering in September. Drouet refers to it as a tree to 10 m. tall, bordering tidal flats. Martius found it growing in river forests at the mouths of maritime streams, flowering in March, August, and September.

In my publications previous to 1975 I regarded this plant as merely an anomalous form of A. germinans (L.) L. and herbarium specimens are so annotated by me in various herbaria. I feel now that it is, rather, a variety of the northeastern South American A. elliptica Holm and it is very probable that some other of the many collections cited by me in Phytologia 7: 204--206 (1960) and 14: 328 (1967) as A. germinans may prove, on re-examination, to be A. elliptica var. martii instead.

Citations: SURINAM: Lanjouw & Lindeman 301 (N, Ut--17661b). BRAZIL: Ceará: Drouet 2442 (E--1110546, F--857471, F--949342, N, N, S, Sp--37514, W--1594848). Pará: Ducke 9818 [Herb. Rio Jan. 5407] (N); Martius 2644 (Mu--1070), s.n. [Mart. 1820] (Mu--1072), s.n. [Rio Toncatins, Aug.] (Mu--1071), s.n. [sylvis ripariis ad ostia fluv. maritimorum, Sept.; N. Y. Bot. Gard. Type Photo. Coll. Neg., new ser. 8922] (Mu--1069--type, N--photo of type, Z--isotype, Z--photo of type).

AVICENNIA EOCENICA Berry
Additional bibliography: Lamotte, Geol. Soc. Am. Mem. 51: [Cat. Cenoz. Pl. N. Am.] 80. 1952; Moldenke, Phytologia 7: 161--162. 1960; Moldenke, Fifth Summ. 1: 375 (1971) and 2: 839. 1971; Moldenke, Phytologia 32: 365. 1975.

AVICENNIA EUCALYPTIFOLIA Zipp.
Additional synonymy: Avicennia marina var. resimifera Perry ex Moldenke, Phytologia 26: 370, in syn. 1973 [not A. marina var. resinifera (Forst.) Bakh., 1921].

Additional bibliography: Prain, Ind. Kew. Suppl. 4, imp. 1, 21. 1913; Fedde & Schust. in Just, Bot. Jahresber. 56 (2): 285. 1937; Prain, Ind. Kew. Suppl. 4, imp. 2, 21. 1958; R. Good, Geogr. Flow. Pl. 241. 1964; Moldenke, Phytologia 15: 71. 1967; V. J. Chapm., Trop. Ecol. 11: 5, fig. 3. 1970; Moldenke, Fifth Summ. 1: 314, 329, 331, 333, 334, 338, 340, 344, 349, 391, & 393 (1971) and 2: 839. 1971; Mukherjee, Journ. Palynol. 9: 178, 180, & 181, fig. 5--

8. 1973; Mukherjee & Chanda, Geophyt. 3: 86, text fig. 1, & pl. 1, fig. 2. 1973; Fosberg, Proc. Soc. Internat. Coral Reef Sympos. 1: 395. 1974; Mukherjee, Role Palynol. Tax. Myop. 2, fig. 3. 1974; Mukherjee, Science & Cult. 40: 332. 1974; Moldenke, Phytologia 31: 391. 1975.

Additional illustrations: Mukherjee, Journ. Palynol. 8: 180, fig. 5--8. 1973; Mukherjee & Chanda, Geophyt. 3: 86, text fig. 1, & pl. 1, fig. 2. 1973; Mukherjee, Role Polynol. Tax. Myop. 2, fig. 3. 1974.

Recent collectors describe this plant as a small tree, 2--23 m. tall, with a "good straight bole" 1--10 m. tall, the trunk diameter at breast height 2--35 cm., with pneumatophores present, the bark smooth, greenish-brown to gray or gray-brown, the wood white or creamy-white, the crown dense, with drooping foliage, the leaves elliptic, varying from green, light- or dull-green to bright glossy-green or olive-green above, conspicuously paler or white (or "pale sordid-gray", "pale silvery-green", "gray-brown", or "gray-green") beneath, the flowers faintly fragrant, the stamens dark, the anthers black, and the fruit silvery olive-green. The corollas are said to have been "yellow" on Kumul NGF.36270, "yellow-orange" on Kumul NGF.36271 & NGF.36272, "pale-orange" on Darbyshire 782, "orange" on Gillison NGF.22163, and "cream, yellow inside" on Streimann & Lelean NGF.18466.

Collectors have found the plant growing on coastal mudflats at the edge of the mangrove formation at sealevel, in mangrove swamps, near highwater mark in mangrove forests, in the mangrove littoral with Ceriops and Lumnitzera, or dominating the upper mangrove area, flowering in September and December. The vernacular name, "suari", is recorded for it.

Pollen-grains of A. eucalyptifolia are illustrated by Mukherjee (1974) to bolster his theory of the evolution of the Phrymaceae from the Avicenniaceae and of the Myoporaceae from the Phrymaceae. They are also illustrated and described by Mukherjee & Chanda (1973) based on Versteeg 1893 from New Guinea. It is of interest to note that the pollen characters given for A. eucalyptifolia are said to be the same as for A. marina, A. officinalis, and what is probably A. alba — of all three species it has by some botanists been considered a variety.

Material of A. eucalyptifolia has been misidentified and distributed in some herbaria as A. marina (Forsk.) Vierh.

Additional citations: MOLUCCA ISLANDS: Tanimber: Neth. Ind. Forest Serv. bb.24334 (N). WESSEL ISLANDS: Latz 3391 [Herb. North. Austr. 36913] (Ld). NEW GUINEA: Papua: Brass 21841 (W--2495758); Darbyshire 782 (Ba); Gill s.n. [6 April 1970] (Ba); Gillison NGF.22163 (Mu); Kumul NGF.36270 (Mu), NGF.36271 (Mu), NGF.36272 (Mu); Streimann & Lelean NGF.18466 (Mu). AUSTRALIA: Northern Territory: Gill s.n. [25 March 1970] (Ft--9739). Queensland: Gill 1 (Ft--9719), 5 (Ft--9683), 10 (Ft--9734), s.n. [25 March 1970] (Ld), s.n. [29 March 1970] (Ft--9679), s.n. [30 March 1970] (Ft,

Ft—9678, Z). Western Australia: R. A. Perry 2547 (W—2156543).
[to be continued]

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NOTES ON NEW AND NOTEWORTHY PLANTS. LXXXIV

Harold N. Moldenke

LIPPIA POSSENSIS Moldenke, sp. nov.

Frutex 2 m. altus; ramis densissime hirsutis perdense foliosis; foliis sessilibus suborbiculatis vel orbiculato-ellipticis 2--2.5 cm. latis longisque crassis ad apicem rotundatis vel subacutis ad basin rotundatis marginibus totaliter regulariterque serrulatis supra perspicue rugosis adpresso-villosulis subtus bullatis ubique villosulis margine ipse subinvoluto; inflorescentiis axillaribus ad apicem ramulorum aggregatis spicatis patentissimis vel recurvatis 3--5 cm. longis densissime multifloris 1.5—2 cm. latis; bracteis numerosissimis foliaceis purpureis lanceolatis ad apicem attenuatis venosis densissime villosulis.

Shrub to about 2 m. tall; branches very densely hirsute with wide-spreading whitish hairs, mostly hidden by the very numerous, crowded, mostly ternate, overlapping, sessile, reflexed leaves which are suborbicular to orbicular or rarely orbicular-elliptic, 2--2.5 cm. long and wide, rounded or rarely subacute at the apex, rounded at the base, the total margins abundantly and very regularly serrulate with small bluntish spreading or slightly antrorse teeth, conspicuously rugose above with the entire vein- and veinlet-reticulation sunken, appressed antrorsely villosulous especially on the central section and at the basal part of the leaf, conspicuously bullate and rather densely villosulous throughout beneath, the rather long whitish hairs especially abundant on the larger venation, the ultimate veinlets extending conspicuously to each tooth-sinus but not to the tooth-apex; inflorescence axillary, crowded at the tip of the branches, spicate, the spikes wide-spreading or recurved, very densely flowered and very densely bracteose; bractlets lanceolate, purple-violet, very numerous, imbricate, hiding the flowers, about 1 cm. long and about 5 mm. wide at the base, attenuate to the apex, very densely villosulous throughout; corolla hypocrateriform, light-lilac, the tube white within.

The type of this handsome species was collected by I. & G. Gottsberger (no. 138-25771) "No sopé da Seral Geral do Goiás - Cerrado, na encosta da serra - regiĕo roxoso com cerrado e vales secos", in the Município de Posse, Goiás, Brazil, on July 25, 1971, and is deposited in my personal herbarium at Plainfield, New Jersey. Concerning the flowers, the collectors say "pétalas das flores recém abertas, lilás claro com tubo internamente branco, as mais velhas violáceas escuras".

PETREA MARTIANA var. GLABRESCENS Moldenke, var. nov.

Haec varietas a forma typica speciei foliis maturis supra glabrescentibus non scabris recedit.

This variety differs from the typical form of the species in having at least its mature leaf-blades glabrous or glabrescent and not at all scabrous or even scabrellous above.

The type of the variety was collected by Adolfo Ducke (no. 14291) "ad marginem silvae ultra flumen Curucambá" at Obidos, Pará, Brazil, on June 9, 1926, and is deposited in the Britton Herbarium at the New York Botanical Garden.

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ADDITIONAL NOTES ON THE ERIOCAULACEAE. LVII

Harold N. Moldenke

In this, as in all previous installments of my series of "Additional Notes", the herbarium acronyms employed are those listed and explained by me in my "Fifth Summary 2: 795—801 (1971) and its supplements.

ERIOCAULACEAE Lindl.

Additional synonymy: Eriocauleae Mart., Nov. Act. Acad. Leopold.-Carol. Nat. Cur. 17 (1): 3 & 71. 1835. Eriocaulaceae (L. C. Rich.) A. Rich. ex Malme, Bih. Svensk Vet.-Akad. Handl. 27 (3), no. 11: 26. 1901.

Additional & emended bibliography: P. Herm., Mus. Zeyl., ed. 1, 7—8 & 20 (1717) and ed. 2, 57. 1726; Michx., Fl. Bor.-Am., ed. 1, imp. 1, 2: 165--166 & 335 (1803) and ed. 2, 2: 165--166 & 335. 1820; Bojer, Hort. Maurit. 361. 1837; Meisn., Pl. Vasc. Gen. 1: 406--407. 1842; Hook. f. & Benth. in Hook., Niger Fl. 547—548 & 582. 1849; Miq., Stirp. Surin. 221, pl. 65b. 1850; Miq., Naturk. Verh. Holl. Maatsch. Wet. Haarl., ser. 2, 7: pl. 65. 1851; F. Gerard, Nouv. Fl. Usuel. & Méd. 730. 1853; Welw., Apont. 542. 1858; Paine, Ann. Rep. Univ. N. Y. 18: [Pl. Oneida Co.] 146. 1865; Welw., Trans. Linn. Soc. Lond. 27 (1): 47, 75, & 90. 1869; Körn. in Warm., Vidensk. Meddel. Naturh. Foren. Kjöbenh. 23: [309]—316. 1871; V. A. Pouls., Vidensk. Meddel. Naturh. For. Kjøbenh. 40 [ser. 4, 9]: 221—283, pl. 6—12. 1888; Dalla Torre & Harms, Gen. Siphonog., imp. 1, 53. 1900; Malme, Bih. Svensk Vet. Akad. Handl. 27 (3), no. 11: 26--33, pl. 2, fig. 3. 1901; N. L. Britton, Man., ed. 1, imp. 1, 236--238, 1067, 1068, & 1078 (1901) and ed. 1, imp. 2, 236--238, 1067, 1068, & 1078. 1902; Diels, Fl. Cent.-China 236. 1902; Post & Kuntze, Lexicon 8, 28, 51, 102, 175, 188--189, 203, 216, 219, 223, 293, 312, 328, 337, 361, 383, 412, 431, 445, 466, 476, 526, 536, 544, 546, 560, 563, 568, 569, & 596. 1904; J. C. Willis, Man. & Dict. Flow. Pl., ed. 2, 368 & 498. 1904; N. L. Britton, Man., ed. 2, 236—238, 1099,

& 1101 (1905) and ed. 3, 236--238, 1099, & 1101. 1907; J. C. Willis, Man. & Dict. Flow. Pl., ed. 3, imp. 1, 378 & 512. 1908; H. Lecomte, Bull. Soc. Bot. France 55: 571--573 (1908) and 55: 596 & 643--648. 1909; Dunn & Tutcher, Kew Bull. Misc. Inf. Addit. Ser. 10: 291--292. 1912; J. C. Willis, Man. & Dict. Flow. Pl., ed. 3, imp. 2, 378 & 512. 1914; Fedde & Schust. in Just, Bot. Jahresber. 46 (2): 3--5. 1924; Mattfeld in Just, Bot. Jahresber. 46 (1): 362. 1925; J. C. Willis, Dict. Flow. Pl., ed. 5, 250--251 & 481. 1925; Wangerin in Just, Bot. Jahresber. 46 (1): 402 (1925) and 46 (1): 810. 1926; Fedde & Schust. in Just, Bot. Jahresber. 47 (2): 12. 1926; Pittier, Man. Pl. Usuel. Venez. 344 & 441. 1926; Fedde in Just, Bot. Jahresber. 46 (2): 596 (1929) and 47 (2): 319. 1929; Fedde & Schust. in Just, Bot. Jahresber. 47 (2): 12. 1929; J. C. Willis, Dict. Flow. Pl., ed. 6, imp. 1, 250--251 & 481. 1931; J. Hutchinson, Fam. Flow. Pl., ed. 1, 2: 65--67 & 236, fig. 21. 1934; Moldenke, Phytologia 2: 142. 1946; Moldenke, Lilloa 13: 9--10. 1947; Moldenke, Phytologia 2: 418 & 511. 1948; J. C. Willis, Dict. Flow. Pl., ed. 6, imp. 2, 250--251 & 481 (1948) and ed. 6, imp. 3, 250--251 & 481. 1951; M. R. Henderson, Malay. Wild Fls. Monocot., imp. 1, 212, fig. 127. 1954; Petelot, Pl. Méd. Camb. Laos & Viet. 3: 267 (1954) and 4: 10, 49, 58, 113, 208, 209, & 295. 1954; Rohweder, Farinos. Veg. Salv. 16 & 179, pl. 6, fig. 29, 30, & 32 [thesis]. 1954; J. C. Willis, Dict. Flow. Pl., ed. 6, imp. 4, 250--251 & 481. 1955; Rohweder, Abhandl. Geb. Ausl. Univ. Hamb. 61 [C Naturwiss. 13]: 16 & 179, pl. 6, fig. 29, 30, & 31. 1956; J. C. Willis, Dict. Flow. Pl., ed. 6, imp. 5, 250--251 & 481. 1957; J. Hutchinson, Fam. Flow. Pl., ed. 2, 2: 574--576, fig. 364. 1959; Soukup, Biota 2: 300--303. 1959; J. C. Willis, Dict. Flow. Pl., ed. 6, imp. 6, 250--251 & 481. 1960; Anon., Pl. Highlands Hammock St. Park 4. 1962; Dalla Torre & Harms, Gen. Siphonog., imp. 2, 53. 1963; Prain, Bengal Pl., imp. 2, 1: 121 (1963) and imp. 2, 2: 847--849 & 985. 1963; H. P. Riley, Fam. Flow. Pl. S. Afr. 199. 1963; J. Hutchinson, Gen. Flow. Pl. 1: 41 & 502. 1964; Punt, Reg. Veget. 36: 9. 1964; Shah & Patel, Bull. Bot. Surv. India 12: 27. 1970; Malhotra, Bull. Bot. Surv. India 13: 262. 1971; Malhotra & Moorthy, Bull. Bot. Surv. India 13: 314. 1971; Saxena, Bull. Bot. Surv. India 13: 89. 1971; Shetty & Vivekanathan, Bull. Bot. Surv. India 13: 21, 23, & 40. 1971; Stieber, Castanea 36: 277. 1971; Vajravelu & Joseph, Bull. Bot. Surv. India 13: 271. 1971; Frohne & Jensen, System. Pflanzenr. 218, 263, & 290. 1973; Hartley, Dunstone, Fitzgerald, Johns, & Lamberton, Lloydia 36: 235. 1973; Hocking, Excerpt. Bot. A.21: 211. 1973; J. Hutchinson, Fam. Flow. Pl., ed. 3, 32, 632, 636, 638--642, 648, [655], 657, 710--712, 916, 920, 923, 930, 939, 940, 944, 949, 951, 956, 957, 962, 964, & 967, fig. 364 & 364a. 1973; Vartak, Bull. Indian Nat. Sci. Acad. 45: 249. 1973; H. Walt., transl. Wieser, Veget. Earth [Heidelb. Sci. Lib. 15:] 77 & 234. 1973; Anon., Biol. Abstr. 58 (7): B.A.S.I.C. E.108 & E.222. 1974; Ayensu, Rep. Endang. & Threat. Pl. Sp. 56, 81, 107, 127, 130, 142, 143, 148, & 151. 1974; El-Gazzar, Egypt. Journ. Bot. 17: 82. 1974; Farnsworth, Pharmacog. Titles 9 (1): x. 1974; R. D. Gibbs, Chemotax. Flow. Pl. 2: 1122 (1974), 3: 1877, 1880--1883, 1886, 1887, 1894--1896,

1911, & 1914 (1974), and 4: 2118--2219. 1974; Greenslet in Foley, Herbs for Use & Delight [192]. 1974; M. R. Henderson, Malay. Wild Fls. Monocot., imp. 2, 212, fig. 127. 1974; Hocking, Excerpt. Bot. A.23: 290--293 & 314. 1974; Kulkarni & Desai, Journ. Bombay Nat. Hist. Soc. 71: [80]--84, fig. 1--19. 1974; León & Alain, Fl Cuba, imp. 2, 1: 278--284, 423, 426, 428, & 435--436, fig. 112 & 113. 1974; Lieth, Phenol. & Season. Model. 444. 1974; Michx., Fl. Bor.-Am., ed. 1, imp. 2, 2 [Ewan, Class. Bot. Am. 3]: 165--166 & 335. 1974; Moldenke, Biol. Abstr. 57: 3780 (1974) and 58: 3844. 1974; Shah & Yogi, Journ. Bombay Nat. Hist. Soc. 71: 62. 1974; Soukup, Biota 10: 231. 1974; J. A. Steyerm., Biotropica 6: 7 & 10. 1974; Widder, Excerpt. Bot. A.24: 329. 1974; Anon., Naturalists Directory 42: 60. 1975; Anon., Off. Staff Publ. N. Y. Bot. Gard. Addend. 2. 1975; Anon., Taxon 24: 173. 1975; Asher, Guide Bot. Period. 2 (8): 54. 1975; D. S. & H. B. Correll, Aquat. & Wetland Pl. SW. U. S., imp. 2, 1: 21 & 588--[594], fig. 301--304 (1975) and 2: 1751. 1975; Duncan & Foote, Wildfls. SE. U. S. 3, 5, 240, [241], 286, & 287. 1975; R. & A. Fitter, Wild Fls. Brit. & N. Eu. 260, 261, & 330. 1975; Jaeger & Moldenke, Phytologia 30: 405. 1975; Marquis, Who's Who East, ed. 15, 503. 1975; Moldenke, Biol. Abstr. 59: 6926 & 6934. 1975; Moldenke, Phytologia 30: 15--62, 71--125, 251--280, 317--343, 506--509, 511, & 512 (1975), 31: 26, 27, 229, 232, 233, 360, 374--376, 378--392, 396--398, 400, & 402--408 (1975), and 32: 47 & 336. 1975; Molina R., Ceiba 19: 24. 1975; Shah, Biol. Abstr. 59: 6329. 1975.

The Lecomte reference in the above bibliography is sometimes cited as "1908", but the "Index Kewensis" dates the latter pages of this volume as published in 1909, although the papers themselves were presented in sessions of the society held in the latter months of 1908. The Endlicher (1836) reference is often cited as "1836--1856, but the pages involved here were actually issued in 1836. The Meisner (1842) reference is sometimes cited as "1836--1843", but the pages here involved were issued in 1842.

According to Hutchinson (1959) the family is also referred to in Vol. 1, p. 30, of his 1959 work, but I fail to find it mentioned on that page. The Fitter work, also cited above, is dated "1974", but was not actually published until February 17, 1975. Malme's work (1901) is sometimes erroneously cited as "1903".

Gibbs (1974) found silica-bodies in one species of this family and p-coumaric acid, sinapic acid, ferulic acid, and flavanols also present.

Riley (1963) comments that "the family seems to be of no particular importance economically". The sale of dried Syngonanthus inflorescences in Brazil is, in fact, the only economic use I know of for members of the group.

BLASTOCAULON Ruhl.

Additional & emended bibliography: J. Hutchinson, Fam. Flow. Pl., ed. 1, 2: 67 & 234 (1934) and ed. 2, 2: 576 & 749. 1959; Hocking, Excerpt. Bot. A.21: 211. 1973; Moldenke, Phytologia 29: 281 (1974) and 30: 85 & 506. 1975.

BLASTOCAULON RUPESTRE (G. Gardn.) Ruhl.

Additional bibliography: Hocking, Excerpt. Bot. A.21: 211. 1973; Moldenke, Phytologia 29: 82 (1974) and 30: 85. 1975.

CARPTOTEPALA Moldenke

Additional bibliography: Hocking, Excerpt. Bot. A.21: 211. 1973; J. Hutchinson, Fam. Flow. Pl., ed. 3, 710. 1973; Moldenke, Phytologia 29: 281 & 506. 1974.

CARPTOTEPALA JENMANI (Gleason) Moldenke

Additional bibliography: Hocking, Excerpt. Bot. A.21: 211. 1973; Moldenke, Phytologia 29: 82. 1974.

COMANTHERA L. B. Sm.

Additional & emended bibliography: Moldenke, Phytologia 2: 371—373 & 381 (1947) and 3: 32 & 42. 1948; Moldenke, Alph. List Cit. 4: 984. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 65, 66, 90, 203, & 212. 1949; E. J. Salisb., Ind. Kew. Suppl. 11: 244. 1953; J. Hutchinson, Fam. Flow. Pl., ed. 2, 2: 576 & 755. 1959; Tamayo, Bol. Soc. Venez. Cienc. Nat. 22: 41, 88, & 149. 1961; Hocking, Excerpt. Bot. A.21: 211. 1973; J. Hutchinson, Fam. Flow. Pl., ed. 3, 710. 1973; Heslop-Harrison, Ind. Kew. Suppl. 15: 34. 1974; Moldenke, Phytologia 29: 281 & 506. 1974.

COMANTHERA KEGELIANA (Körn.) Moldenke

Additional & emended bibliography: Moldenke, Phytologia 2: 371—373 & 381 (1947) and 3: 32 & 42. 1948; Moldenke, Alph. List Cit. 4: 984. 1949; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 65, 66, 90, 203, & 212. 1949; E. J. Salisb., Ind. Kew. Suppl. 11: 244. 1953; Tamayo, Bol. Soc. Venez. Cienc. Nat. 22: 41, 88, & 149. 1961; Heslop-Harrison, Ind. Kew. Suppl. 15: 34. 1974; Moldenke, Phytologia 29: 82--83. 1974.

The illustration given by Tamayo (1961), p. 149, labeled "Syngonanthus akurimensis Moldenke" [a synonym of Comanthera kegeliana] actually represents typical Syngonanthus caulescens (Poir.) Ruhl. It obviosly is not a photograph of Tamayo 3234 on which S. akurimensis was based.

ERIOCAULON Gron.

Additional synonymy: Randiala Petiv. apud Lam., Encycl. Méth. Bot. 3: 276, in syn. 1789. Eriocaulum Hook. f. ex Post & Kuntze, Lexicon 203, in syn. 1904. Eriocaulon [Gronovius] L. apud J. D. Small, Fl. Miami 37. 1913. Eriocaulon Mart. ex Moldenke, Résumé 285, in syn. 1959. Eirocaulon N. E. Br. ex Moldenke, Phytologia 31: 397, in syn. 1975.

Additional & emended bibliography: Lam., Encycl. Méth. Bot. 3: 275--276. 1789; Michx., Fl. Bor.-Am., ed. 1, imp. 1, 2: 165—166 & 335 (1803) and ed. 2, 2: 165—166 & 335. 1820; Bojer, Hort. Maurit. 361. 1837; Meisn., Pl. Vasc. Gen. 1: 407. 1842; Hook. f. & Benth. in Hook., Niger Fl. 547--548 & 582. 1849; Paine, Ann. Rep. Univ. N. Y. 18: [Pl. Oneida Co.] 146. 1865; Körn. in Warm.,

Vidensk. Meddel. Naturh. Foren. Kjöbenh. 23: 315—316. 1871; Kuntze, Rev. Gen. Pl. 2: 746. 1891; Dalla Torre & Harms, Gen. Siphonog., imp. 1, 53. 1900; Diels, Fl. Cent.-China 236. 1902; Post & Kuntze, Lexicon 51, 203, 216, 328, 383, 476, 526, 544, & 569. 1904; J. C. Willis, Man. & Dict. Flow. Pl., ed. 2, 368 (1904) and ed. 3, imp. 1, 378. 1908; H. Lecomte, Bull. Soc. Bot. France 55: 571—573 (1908) and 55: 594, 595, 599, 601, & 643--648. 1909; Dunn & Tutcher, Kew Bull. Misc. Inf. Addit. Ser. 10: 291—292. 1912; J. C. Willis, Man. & Dict. Flow. Pl., ed. 3, imp. 2, 378. 1914; Fedde & Schust. in Just, Bot. Jahresber. 46 (2): 3. 1924; J. C. Willis, Dict. Flow. Pl., ed. 5, 251. 1925; Wangerin in Just, Bot. Jahresber. 46 (2): 402 (1925) and 46 (1): 810. 1926; Fedde & Schust. in Just, Bot. Jahresber. 47 (2): 12 (1926) and 47 (2): 12. 1929; Fedde in Just, Bot. Jahresber. 46 (2): 596 (1929) and 47 (2): 319. 1929; J. C. Willis, Dict. Flow. Pl., ed. 6, imp. 1, 251. 1931; J. Hutchinson, Fam. Flow. Pl., ed. 1, 2: 67 & 236. 1934; J. C. Willis, Dict. Flow. Pl., ed. 6, imp. 2, 251 (1948) and ed. 6, imp. 3, 251. 1951; M. R. Henderson, Malay. Wild Fls. Monocot., imp. 1, 212, fig. 127. 1954; Petelot, Pl. Méd. Camb. Laos & Viet. 3: 267 (1954) and 4: 10, 49, 58, 113, 208, 209, & 295. 1954; Rohweder, Farinos. Veg. Salv. 16. 1954; J. C. Willis, Dict. Flow. Pl., ed. 6, imp. 4, 251. 1955; Darlington & Wylie, Chromos. Atlas, ed. 2, imp. 1, 340. 1956; Rohweder, Abhandl. Geb. Ausl. Univ. Hamb. 61 [C Naturwiss. 13]: 16. 1956; J. C. Willis, Dict. Flow. Pl., ed. 6, imp. 5, 251. 1957; J. Hutchinson, Fam. Flow. Pl., ed. 2, 2: 576 & 760. 1959; Soukup, Biota 5: 300—301. 1959; J. C. Willis, Dict. Flow. Pl., ed. 6, imp. 6, 251. 1960; Anon., Pl. Highlands Hammock St. Park 4. 1962; Dalla Torre & Harms, Gen. Siphonog., imp. 2, 53. 1963; Prain, Bengal Pl., imp. 2, 2: 847—849 & 985. 1963; H. P. Riley, Fam. Flow. Pl. S. Afr. 199 & 260. 1963; Punt, Reg. Veget. 36: 9. 1964; Malhotra, Bull. Bot. Surv. India 13: 262. 1971; Malhotra & Moorthy, Bull. Bot. Surv. India 13: 314. 1971; Saxena, Bull. Bot. Surv. India 13: 89. 1971; Shetty & Vivekanathan, Bull. Bot. Surv. India 13: 21, 23, & 40. 1971; Vajravelu & Joseph, Bull. Bot. Surv. India 13: 271. 1971; Hartley, Dunstone, Fitzgerald, Johns, & Lamberton, Lloydia 36: 294. 1973; Hocking, Excerpt. Bot. A.21: 211. 1973; Vartak, Bull. Indian Nat. Sci. Acad. 45: 249. 1973; H. Walt., transl. Wieser, Veget. Earth [Heidelb. Sci. Lib. 15:] 77 & 234. 1973; Anon., Biol. Abstr. 58 (7): B.A.S.I.C. E.108 & E.222. 1974; Ayensu, Rep. Endang. & Threat. Pl. Sp. 56, 107, 143, & 151. 1974; Farnsworth, Pharmacog. Titles 9 (1): x. 1974; R. D. Gibbs, Chemotax. Flow. Pl. 2: 1122 (1974), 3: 1883 (1974), and 4: 2119. 1974; M. R. Henderson, Malay. Wild Fls. Monocot., imp. 2, 212, fig. 127. 1974; Kulkarni & Desai, Journ. Bombay Nat. Hist. Soc. 71: [80]—84, fig. 1—19. 1974; León & Alain, Fl. Cuba, imp. 2, 1: 279—281, fig. 112. 1974; Lieth, Phenol. & Season. Model. 444. 1974; Michx., Fl. Bor.-Am., ed. 1, imp. 2, 2 [Ewan, Class. Bot. Am. 3]: 165—166 & 335. 1974; Moldenke, Biol. Abstr. 57: 3780. 1974; Shah & Yogi, Journ. Bombay Nat. Hist. Soc. 71: 62. 1974; J. A. Steyerm., Biotropica 6: 7 & 10. 1974; Anon., Taxon 24: 173. 1975; D. S. & H. B. Correll, Aquat. & Wetland Pl. SW. U. S., imp.

2, 1: 588--593, fig. 301--303 (1975) and 2: 1751. 1975; Duncan & Foote, Wildfls. SE. U. S. 3, 240, [241], 286, & 287. 1975; R. & A. Fitter, Wild Fls. Brit. & N. Eu. 260, 261, & 330. 1975; Moldenke, Phytologia 30: 71--72, 77, 78, 81--83, 85, 90, 91, 99, 110, 111, 114, 115, 117, 118, 121, 122, 124, 252, 254--256, 259, 262--267, 269--275, 279, 280, 323, 329, 330, 332, 333, 337--339, & 341--343 (1975) and 31: 26, 229, 360, 375, 376, 378, 381, 383, 384, 388--391, 397, 398, 400, & 404. 1975; Molina R., Ceiba 19: 24. 1975; Shah, Biol. Abstr. 59: 6329. 1975.

The Lecomte (1909) reference in the above bibliography is sometimes cited as "1908", but according to the "Index Kewensis" the latter pages of this volume did not appear until 1909, although the material on them was presented in sessions of the society in 1908. The Endlicher reference (1836) is often cited as "1836-1856", but the page involved here was actually published in 1836. The Meisner reference (1842) is sometimes cited as "1836-1843", but the page involved here was actually issued in 1842. The Fitter work is dated "1974", but was not actually published until February 17, 1975. Malme's work (1901) is sometimes erroneously cited as "1903".

Fedde (1929) asserts that the genus is mentioned on page "827" of the work cited, but I have not been able to find it on that page.

It is worth noting that Post & Kuntze (1904) list a Section Eueriocolon Baill. as a synonymy of Section Eueriocaulon Körn.

Gibbs (1974) reports that alumimum is doubtfully accumulated by plants of this genus, that saponins are absent or probably absent, tannins are absent, 6-hydroxyl-flavonol quercetagetin is present in some species but absent in others, patulin is present, and quercetin is present in at least one species; erioflavonol, he affirms, may also be present. Riley (1963) reports the sporophyte chromosome numbers for members of this genus as 32 & 36; Eriocaulon cinereum, however, is said to have 18 as the 2n count.

ERIOCAULON ABYSSINICUM Hochst.

Additional bibliography: Hocking, Excerpt. Bot. A.21: 211. 1973; Moldenke, Phytologia 29: 87 & 231. 1974.

ERIOCAULON ACHITON Körn.

Additional bibliography: Venkatareddi, Bull. Bot. Surv. India 12: 220. 1970; Moldenke, Phytologia 29: 87. 1974.

Venkatareddi (1970) refers to this species as "Occasional", flowering in August and September, citing his no. 99102. Vartak found it growing on moist cliffs, flowering and fruiting in September.

The Schmid 80 from Annam, previously cited by me as E. achiton, appears, instead, to be E. boni H. Lecomte. If this is true, then E. achiton is not now known from Indochina.

Additional citations: INDIA: Maharashtra: Vartak RD.1 (Ld). Mysore: Bogner 494 (Mu).

ERIOCAULON ALPESTRE Hook. f. & Thoms.
Additional bibliography: Dunn & Tutcher, Kew Bull. Misc. Inf. Addit. Ser. 10: 292. 1912; Moldenke, Phytologia 29: 88 & 221. 1974.

ERIOCAULON ALPINUM Van Royen
Additional bibliography: Moldenke, Phytologia 25: 233 & 247. 1973.
Croft & Lelean refer to this plant as being an herb having "medium-green leaves and brown inflorescences, forming hard cushions", in Papua. They encountered it at 3600 m. altitude, flowering in June.
Additional citations: NEW GUINEA: Papua: Croft & Lelean LAE. 61474 (W—2741753).

ERIOCAULON ANGUSTIFOLIUM Körn.
Additional bibliography: Moldenke, Phytologia 29: 89. 1974.
Hatschbach encountered this plant in "campo, nas rochas submersas de riacho", flowering and fruiting in May.
Additional citations: BRAZIL: Goiás: Hatschbach 36841 (Z).

ERIOCAULON AQUATICUM (J. Hill) Druce
Additional bibliography: Collett, Fl. Siml. 549. 1902; Knoche, Fl. Balear., ed. 1, 162 & 393. 1923; J. Hutchinson, Fam. Flow. Pl., ed. 2, 2: 760. 1959; Hocking, Excerpt. Bot. A.21: 211. 1973; R. D. Gibbs, Chemotax. Flow. Pl. 3: 1883 (1974) and 4: 2119. 1974; Knoche, Fl. Balear., ed. 2, 3: 162 & 393. 1974; Moldenke, Phytologia 29: 281—282 (1974) and 31: 388 & 397. 1975; Ross-Craig, Drawings Brit. Pl. Ind. 16. 1974; R. & A. Fitter, Wild Fls. Brit. & N. Eu. 260, 261, & 330. 1975.
Additional illustrations: J. Hutchinson, Fam. Flow. Pl., ed. 3, 712, fig. 364a. 1973; R. & A. Fitter, Wild Fls. Brit. & N. Eu. 260, 261, & 330. 1975.
Hutchinson (1959) says that this taxon is referred to in Vol. 1, p. 30, of his cited 1959 work, but I fail to find it mentioned there. The Fitter work cited above is dated "1974", but was not officially published until February 17, 1975.
Gibbs (1974) reports tannin present in this species, by cyanogenesis, leucoanthocyanin, and mucilage absent.

ERIOCAULON ARENICOLA Britton & Small
Additional bibliography: Moldenke, Phytologia 24: 343. 1972; León & Alain, Fl. Cuba, imp. 2, 1: 280 & 423. 1974.
Morton found this plant in flower and fruit in February.
Additional citations: ISLA DE PINOS: C. V. Morton 10076 (W—2351393).

ERIOCAULON ATRATUM Körn.
Additional bibliography: Moldenke, Phytologia 29: 85, 91—92, 98, 205, & 232 (1974) and 30: 124. 1975.
Emended citations: SRI LANKA: Jayasuriya & Sumithraarachchi 1567 (N); Moldenke, Moldenke, Jayasuriya, & Sumithraarachchi

28271a (W—2765378), 28280(W—2765386).

ERIOCAULON AUSTRALE R. Br.

Additional bibliography: Dunn & Tutcher, Kew Bull. Misc. Inf. Addit. Ser. 10: 291 & 292. 1912; Moldenke, Phytologia 29: 92 (1974) and 31: 391. 1975.

Latz describes this plant as an "erect broad-leaved sedge, rare" and found it growing in seepage areas of sandstone, flowering and fruiting in October. Dunlop found it growing in 10 cm. deep water of a freshwater pool in clay soil, flowering in April.

Additional citations: AUSTRALIA: Northern Territory: C. Dunlop 3448 (Ld). AUSTRALIAN ISLANDS: Wessel: Latz 3407 [Herb. North. Terr. 36931] (Z).

ERIOCAULON BAURI N. E. Br.

Additional synonymy: Eirocaulon baurii N. E. Br. ex Moldenke, Phytologia 31: 397, in syn. 1975.

Additional bibliography: Moldenke, Phytologia 29: 93 & 233 (1974) and 31: 397. 1975.

Bayliss encountered this plant in marshy ground and describes it as having "erect stems of white flowers in small clumps". He found it at 8000 feet altitude, flowering in January.

Additional citations: LESOTHO: Bayliss BS.5382 (N).

ERIOCAULON BENTHAMI Kunth

Additional bibliography: Moldenke, Phytologia 24: 346. 1972.

Hinton found this plant growing "by water", at altitudes of 1000—2510 meters, flowering in May.

The Edw. Palmer 44, Skutch 617, and Townsend & Barber 117, distributed as E. benthami, seem, rather, to represent E. ehrenbergianum Klotzsch.

Additional citations: MEXICO: México: Hinton 627 (W—1822074), 3488 (W—1636282), 3638 (W—1822099), 4549 (W—1636296).

ERIOCAULON BIFISTULOSUM Van Heurck & Muell.-Arg.

Additional bibliography: Lieth, Phenol. & Season. Model. 444. 1974; Moldenke, Phytologia 29: 282. 1974.

Wingfield encountered this plant at 7110 feet altitude in Tanganyika. Malaisse (1974) asserts that in Zambia it flowers in February and March, while the very similar E. setaceum L. does not flower until May.

Material has been misidentified and distributed in some herbaria as E. setaceum L.

Additional citations: TANZANIA: Tanganyika: Wingfield 594 (N).

ERIOCAULON BILOBATUM Morong

Additional bibliography: Moldenke, Phytologia 26: 17—18. 1973.

Additional citations: MEXICO: Jalisco: Pringle 3855 (W—937181—isotype), 6299 (W—254686, W—937155).

ERIOCAULON BOMBAYANUM Ruhl.

Additional bibliography: Cooke, Fl. Presid. Bombay, ed. 1, 2: 850 (1908), ed. 2, imp. 1, 3: 362 (1958), and ed. 2, imp. 2, 3: 362. 1967; Moldenke, Phytologia 29: 94. 1974.

Cooke (1906) informs us that at the time of the writing of his Flora he had seen no specimens of this species and none were in the Kew herbarium.

ERIOCAULON BONI H. Lecomte

Additional bibliography: Moldenke, Phytologia 29: 94. 1974.

The Schmid 80, cited below and here illustrated, was previously erroneously cited by me as E. achiton Körn., a species which it closely resembles. It seems to me now, however, that it represents Lecomte's E. boni, a species hitherto known to me only from the original description. In the illustration presented herewith and drawn by Charles C. Clare, Jr., in October, 1975, the following is the legend: A - Habit; B - Flower-head; C - Involucral bractlet, exterior view; D - Receptacular bractlet, exterior view; E - Staminate floret, sepals removed; F - Sepal of staminate floret; G - Pistillate floret, sepals removed; H - Sepal of pistillate floret; J - Petal of pistillate floret; K - Gynoecium; L - Seed.

The specimen was collected on schist at about 400 meters altitude in the Dak Dam mountains, J. Jeng Drom region, southern Annam.

Additional citations: INDOCHINA: Annam: Schmid 80 (N, N--floral drawings, Z--floral drawings).

ERIOCAULON BREVISCAPUM Körn.

Additional bibliography: Woodr., Journ. Bomb. Nat. 13: 429. 1901; Cooke, Fl. Presid. Bombay, ed. 1, 2: 842 & 844 (1908), ed. 2, imp. 1, 3: 353 & 356 (1958), and ed. 2, imp. 2, 3: 353 & 356. 1967; Moldenke, Phytologia 29: 95 (1974) and 30: 262. 1975.

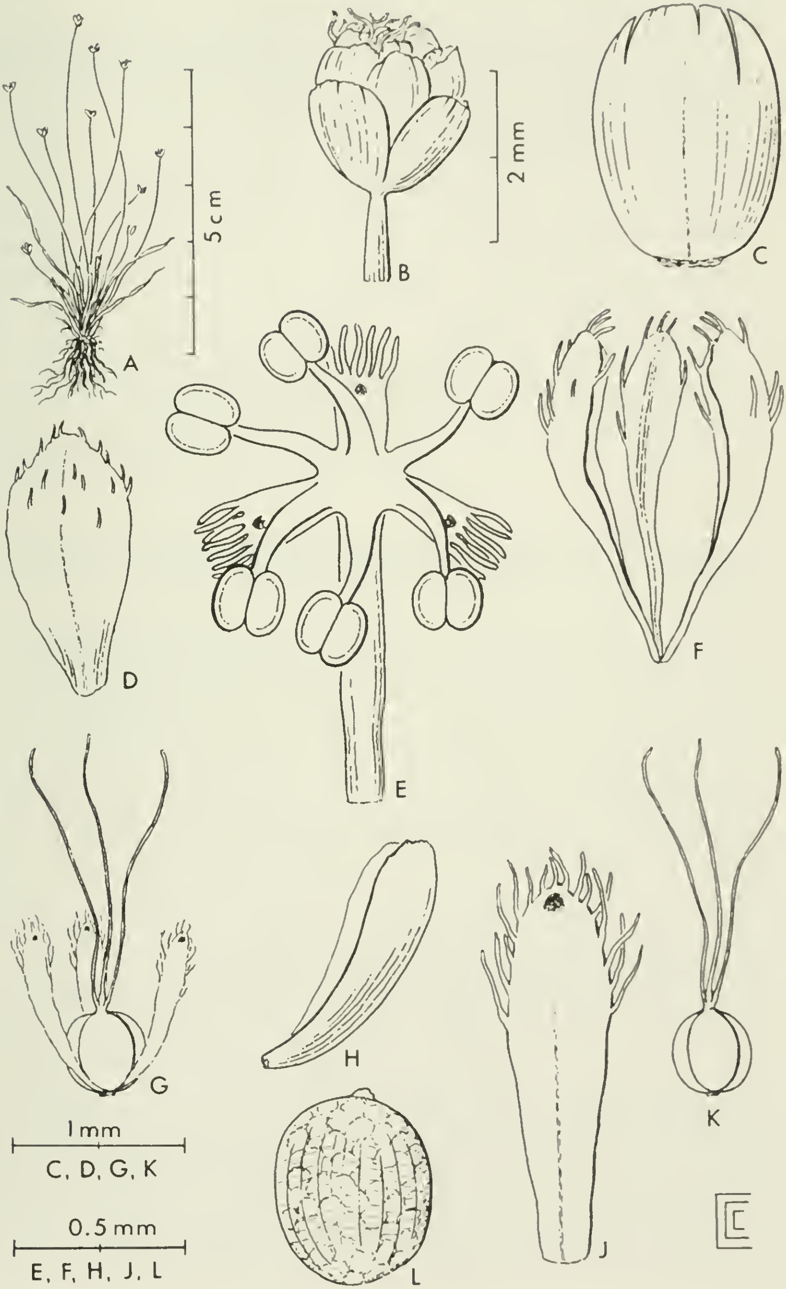
Cooke (1906) cites only Talbot 1379 & 1609 from Bombay and states that when he wrote his Flora there were only those two sheets representing the species in the Kew herbarium. He describes the species as "Rare" at 2000 feet altitude, flowering from December to February.

ERIOCAULON BROWNIANUM Mart.

Additional bibliography: J. Grah., Cat. Pl. Bomb. 231. 1839; Shetty & Vivekanathan, Bull. Bot. Surv. India 13: 23 & 40. 1971; Mani, Ecol. & Bioge gr. India [Illies, Monog. Biolog. 23:] 187 & 741. 1974; Moldenke, Phytologia 29: 282. 1974.

Cramer describes this plant as having "Heads flattened, up to 1.2 cm. in diameter, ashy-grey. Anthers grey" and found a "single tree [sic]" in the open "by drain along borders of tea field".

Additional citations: SRI LANKA: Cramer 3809 (W--2766818); Moldenke, Moldenke, Jayasuriya, & Sumithraarachchi 28293 (E, W--2765401), 28296 (W--2765398); Sumithraarachchi & Jayasuriya DBS. 190 (Ld).


5 cm
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C, D, G, K
0.5 mm
E, F, H, J, L

ERIOCAULON BROWNIANUM var. LATIFOLIUM Moldenke
Additional bibliography: Moldenke, Phytologia 29: 282. 1974.
Additional citations: SRI LANKA: Moldenke, Moldenke, Jayasuriya, & Sumithraarachchi 28297 (W--2765397), 28306 (W--2765390).

ERIOCAULON BUERGERIANUM Körn.
Additional bibliography: Dunn & Tutcher, Kew Bull. Misc. Inf. Addit. Ser. 10: 292. 1912; Moldenke, Phytologia 29: 97. 1974.

ERIOCAULON CARAJENSE Moldenke
Additional bibliography: Moldenke, Biol. Abstr. 57: 3780. 1974; Moldenke, Phytologia 29: 98. 1974.

ERIOCAULON CARSONI F. Muell.
Additional bibliography: Moldenke, Phytologia 24: 349. 1972.
Henry describes this plant as an "erect herb with globular heads, rare in moist clay at edge of lagoon" and found it in flower and fruit in June.
Additional citations: AUSTRALIA: Northern Territory: N. Henry 125 (Ld, Z).

ERIOCAULON CEYLANICUM Körn.
Additional synonymy: Syngonanthus argenteus Benth., in herb.
Additional bibliography: Moldenke, Phytologia 29: 85, 86, 91, 98--99. 105. 205. & 232. 1974.
Cramer describes this plant as having "heads snowy white, up to 1.5 cm. in diameter" and encountered it in open marshy ground among short grass, at 2760 meters altitude, flowering in August, where, he says, it was "common". Koyama describes it as "white-headed pipeworts occasional in wet depressions in wet black Patana grasslands with Gentianella" and found it growing at 7000 feet, flowering in March.
The Koyama collection, cited below, was previously erroneously cited by me as E. dalzellii Körn.
Additional citations: SRI LANKA: Cramer 3133 (W--2718359); T. Koyama 13516 (N).

ERIOCAULON CINEREUM R. Br.
Additional synonymy: Eriocaulon seiboldianum Sieb. & Zucc. apud Saxena, Bull. Bot. Surv. India 12: 62, sphalm. 1970.
Additional & emended bibliography: Dalz. & Gibs., Bomb. Fl. 279. 1861; Woodr., Journ. Bomb. Nat. 13: 429. 1901; Collett, Fl. Siml. 549--550, fig. 180. 1902; Diels, Fl. Cent.-China 236. 1902; Cooke, Fl. Presid. Bombay, ed. 1, 2: 842 & 845--846. 1908; Dunn & Tutcher, Kew Bull. Misc. Inf. Addit. Ser. 10: 292. 1912; Cooke, Fl. Presid. Bombay, ed. 2, imp. 1, 3: 354 & 357--358. 1958; Prain, Bengal Pl., imp. 2, 2: 848 & 985. 1963; Cooke, Fl. Presid. Bombay, ed. 2, imp. 2, 3: 354 & 357--358. 1967; Malhotra, Bull. Bot. Surv. India 13: 262. 1971; Moldenke, Phytologia 29: 282 (1974), 30: 279 & 280 (1975), and 31: 397. 1975.
Emended illustrations: Collett, Fl. Siml. 550, fig. 180. 1902.

Cooke (1906) cites only Stocks s.n. and Talbot 1290 from Bombay, giving the general distribution of the species as "Throughout India; Ceylon, China, Japan". In Bombay he reports it as being "Rare". Siddiqi, in his as yet unpublished discussion of the family in Pakistan, cites Burtt & Kazmi B.1300 and Siddiqi s.n., both in the Rawalpindi herbarium, from Hazara and Kashmir in Pakistan, occurring as a weed in ricefields at 5000--6000 feet altitude, flowering in August and September. He records the chromosome count as n = 9. Henry describes it as a "small erect herb, globular heads, rare" and encountered it in moist clay at the edge of lagoons, flowering and fruiting in June. He comments truly that the species is "close to E. pygmaeum Soland." Elliott & Nakamine found it "common" in rice paddies on Okinawa, while in Australia Must found it as an herb to 5 cm. tall in sandy soil along roadsides, the white flowers appearing in May.

Additional citations: INDIA: Maharashtra: Vartak RD.28 (Ac). SRI LANKA: Moldenke, Moldenke, & Albert 28320 (W--2765411). RYUKYU ISLANDS: Okinawa: Elliott & Nakamine 628 (W--2591840A). AUSTRALIA: Northern Territory: N. Henry 126 [Herb. North. Terr. 31675] (Ac, Gz, Ld); Must 1212 (Ld).

ERIOCAULON CIPOENSE Alv. Silv.

Additional bibliography: Fedde & Schust. in Just, Bot. Jahresber. 46 (2): 3. 1924; Moldenke, Phytologia 29: 101. 1974.

ERIOCAULON COLLINUM Hook. f.

Additional bibliography: Shetty & Vivekanathan, Bull. Bot. Surv. India 13: 40. 1971; Vajravelu & Joseph, Bull. Bot. Surv. India 13: 271. 1971: Mani. Ecol. & Biogeogr. India [Illies, Monog. Biolog. 23:] 187 & 741. 1974; Moldenke, Phytologia 29: 282. 1974.

Sumithraarachchi & Waas encountered this plant in a permanent pool of water, most parts of the plant covered by the water. Shatty & Vivekanathan (1971) report it as "common in marshy places in grassland" and also as "rare" in the same habitat elsewhere, at 2000--2075 meters altitude, flowering in April and November, and cite their nos. 26484 & 27403. Vajravelu & Joseph (1971) describe it as a "Small herb in tufts in marshy places, peduncles few to many, heads globose, ashy black" and cite their no. 16189.

Additional citations: SRI LANKA: Moldenke, Moldenke, Jayasuriya, & Sumithraarachchi 28271 (W--2765415), 28272 (W--2765377), 28283 (W--2765384), 28287 (E, W--2765380), 28307 (E, W--2765391); Sumithraarachchi & Jayasuriya DBS.205 (Z), DBS.264 (Z).

ERIOCAULON COLLINUM var. NANUM Moldenke

Additional bibliography: Moldenke, Phytologia 29: 102. 1974.

Additional citations: SRI LANKA: Moldenke, Moldenke, Jayasuriya, & Sumithraarachchi 28284 (W--2765383).

ERIOCAULON COMPRESSUM Lam.

Additional & emended bibliography: Michx., Fl. Bor.-Am., ed. 1, imp. 1, 2: 165 (1803), ed. 2, 2: 165 (1820), and ed. 1, imp. 2, 2

[Ewan, Class Bot. Am. 3]: 165. 1974; Moldenke, Phytologia 29: 282 & 286 (1974) and 30: 57 & 255. 1975; D. S. & H. B. Correll, Aquat. & Wetland Pl. SW. U. S., imp. 2, 1: 590-592, fig. 302 (1975) and imp. 2, 2: 1751. 1975.

The Porters report this plant as common on the wet sandy banks of canals in cypress swamps.

Additional citations: FLORIDA: Lake Co.: Porter & Porter 10770 (N).

ERIOCAULON COMPRESSUM var. HARPERI Moldenke

Additional bibliography: Moldenke, Phytologia 29: 104. 1974.

Additional citations: FLORIDA: Wakulla Co.: Moldenke & Moldenke 29408 (Gz, Ld).

ERIOCAULON CRASSISCAPUM Bong.

Additional bibliography: Körn. in Warm., Vidensk. Meddel. Naturh. Foren. Kjöben. 23: 315. 1871; Malme, Bih. Svensk Vet.-Akad. Handl. 27 (3), no. 11: 32. 1901; Moldenke, Phytologia 29: 90 & 105 (1974) and 30: 269. 1975.

Körnicke (1871) cites Warming s.n. from "In ripas ad lacum Lagoa Santa, Februario", while Malme (1901) cites Lindberg 570, Mosén 1738, and Regnell III:1269 from Minas Gerais, Brazil. Malme's work is sometimes erroneously cited as "1903".

ERIOCAULON CRISTATUM Mart.

Additional bibliography: Dunn & Tutcher, Kew Bull. Misc. Inf. Addit. Ser. 10: 292. 1912; Moldenke, Phytologia 29: 282 (1974) and 31: 389 & 390. 1975.

ERIOCAULON CRISTATUM var. BREVICALYX C. H. Wright

Additional bibliography: Moldenke, Phytologia 24: 352—353 (1972) and 31: 390. 1975.

Hu encountered this plant "on rocks of slow-flowing stream, in bright sun" and describes it as having a "rhizome 5--10 cm. long, forming a mat over the rock surface". He found it in flower in November, but misidentified it as Eriocaulon "setaccum L."

Citations: HONGKONG ISLANDS: High: S. Y. Hu 8906 (W—2731343).

ERIOCAULON CUBENSE Ruhl.

Additional bibliography: León & Alain, Fl. Cuba, imp. 2, 1: 280 & 423. 1974; Moldenke, Phytologia 29: 105. 1974.

ERIOCAULON CUSPIDATUM Dalz.

Additional bibliography: Woodr., Journ. Bomb. Nat. 13: 429. 1901; Cooke, Fl. Presid. Bombay, ed. 1, 2: 842 & 847—848 (1908), ed. 2, imp. 1, 3: 354 & 359—360 (1958), and ed. 2, imp. 2, 3: 354 & 359—360. 1967; Moldenke, Phytologia 29: 106. 1974.

Cooke (1908) cites Dalzell s.n., Law s.n., Stocks s.n., and Talbot 1083 from Bombay, where he says the species flowers in November. He gives its general distribution as only "India (W. Peninsula)". [to be continued]

BOOK REVIEWS

Alma L. Moldenke

"THE WILD FLOWERS OF BRITAIN AND NORTHERN EUROPE" text by Richard Fitter & Alastair Fitter, illustrations by Marjorie Blamey, 336 pp., illus., Charles Scribner's Sons, New York, N. Y. 10017. [1974] 1975. $10.00.

For the native and the established introductions of flowering plants (except for high alpines, grasses, sedges and rushes) of the northwest quadrant of Europe there are over 1200 colored illustrations with usually 7 to 9 on the right hand page while on the matching left hand page are listed common and scientific names and other pertinent data not obviously duplicated in the neighboring illustrations.

This delightful book is crammed — but interestingly, attractively, helpfully and accurately — with botanical information through very simple, quick-working keys and/or page flipping. The artist has drawn and painted the plants accurately and beautifully from live specimens rushed to her from all over Britain and adjacent covered areas over three years of blooming seasons. In fact, she only took up painting in 1965 as a mature adult. During World War II she trained as a professional photographer. Evidently her eyes (and brain, etc.) have been as critically sensitive to details as were her cameras. The fact that some few colors are not consistently natural is probably due to printing rather than to the painting.

The authors, who are ardent conservationists, suggest that we "Take the book to the plant, not the plant to the book" when making identifications.

This book would be a joyful companion or reminder of a quick trip in or through this area of the world.

"FUNDAMENTALS OF PHOTOGRAPHY" by C. B. Neblette, vii & 351 pp., illus., Van Nostrand Reinhold Company, Toronto, London, Melbourne, Cincinnati & New York, N. Y. 10001. 1970. $12.50.

The author is Dean Emeritus of the College of Graphic Arts and Photography in the Rochester Institute of Technology, neighbor to the Eastman Kodak Research Laboratory. And for any reader who might not know, this fact mediates excellence. The text is geared to a serious college level approach. The first 8 chapters deal with the nature, history and uses in our world and beyond. Basic chemistry, physics and mathematics are assumed and are used effectively. The next 15 chapters deal with the practice of photography — light sources, optics, lenses, cameras, negative materials and processing, direct or reversal positives and their printing, color photography, slides, and projection. Explanations and diagrams on levels far from simple are nevertheless clearly

developed. The printed photographic plates indicate great skill — for instance, in the frontispiece which demonstrates how "infra-red radiation photography made many ancient illegible manuscripts decipherable".

"THE DICTIONARY OF ROSES IN COLOUR" 2nd Impression, text by S. Millar Gault & Patrick M. Synge, photographs by Ernest Crowson, xlv & 191 pp., illus., Michael Joseph Ltd., London WC 1B3EF. 1975. £ 7.75 oversize.

So broad in scope, so careful in preparation, so accurate in its botanical and historical information, so helpful in horticultural practices and principles, so breathtakingly exquisite in its photography — this publication surpasses qualitatively and quantitatively any recent rose publication worldwide.

This beautifully presented study was first published in 1971 as a companion volume to "The Dictionary of Garden Plants in Colour" and, like it, was sponsored by the Royal Horticultural Society. In addition, it was jointly sponsored by the Royal National Rose Society, whose president, Frank M. Bowen, has supplied the Foreword. The first author presents the modern shrub roses, the floribundas, and the hybrid teas. The second author presents the history of rose culture, the species naming and descriptions, specializing in the old garden and climbing roses. The very special quality of the 506 color photographs is the result of the authors' close supervision of only one very highly skilled photographer, his typically using only one camera, his carefully checking light conditions and film sensitivity resulting in colors that are so satisfyingly true to life.

After an interesting history of rose culture, the introduction treats effectively cultivation, pruning and training, tools, propagation, pests and diseases, and plants associated with roses. Then follow the color plates and then the horticultural names, sources, types, introduction, use, and special information, all concisely presented.

"THE BIOCHEMISTRY OF GREEN PLANTS" by David W. Krogmann, xii & 239 pp., illus., Prentice-Hall Inc., Englewood Cliffs, New Jersey 07632. 1973. $11.95 clothbound. 1974. $6.95 paperbound.

This good text is the sixth title in the "Foundations of Modern Biochemistry Series" and it concentrates effectively on widespread phytochemical activities such as photosynthetic C metabolism, photosystems I and II, chloroplast development, and hormonal controls.

The glossaries are incompletely and carelessly presented but the source references are well supplied.

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TAXONOMIC NOTES ON CERTAIN TAXA OF ASIATIC ANGIOSPERMS

G.Panigrahi

Indian Liaison Officer at the Royal Botanic Gardens,Kew.

During my studies in the Indian flowering plants,some of the results obtained on the taxonomy,identity and nomenclature of certain taxa of Asiatic angiosperms are published here for practical reasons. The types mentioned have been studied except where indicated to the contrary.

EUSTERALIS Rafin.(1836) (Labiatae).

El-Gazzar & L.Watson(1967) from their studies involving 37 species belonging to the genera Pogostemon Desf.(1815) and Dysophylla Bl.(1836) divided them into two distinct groups,Group 1 comprising 26 species and Group 2,11 species. They transferred four species of Dysophylla Bl. including the type species D.auriculata (L.)Bl. to Pogostemon Desf., representing the species of Group 1 and kept apart the 11 species of Group 2 to represent the genus Dysophylla auctt.,non Bl.(1826). Since the type species of Dysophylla Bl. was transferred to Pogostemon Desf., Airy Shaw (1967) proposed conservation of the new genus Dysophylla El-Gazzar & L.Watson ex Airy Shaw with D.quadrifolia(Benth.)El-Gazzar & L.Watson ex Airy Shaw as the type species. While doing so, he argued why the generic name Chotekia Opiz & Corda is not available for the species of the section VERTICILLATAE Benth.(1848),but did not say why Eusteralis Rafin.(1836), a validly described genus,could not be used instead. His formal proposal No.200(see Taxon 16:190,1967) for such proposed conservation,has,it is understood,been rejected. Airy Shaw (1973:397,447) now considers Dysophylla El-Gazzar & L.Watson ex Airy Shaw as congeneric and synonymous [illegible] to Eusteralis Rafin. It is pertinent to point out that Rafinesque's description and comments on the genus Eusteralis with E.pumila (Grah.)Rafin. as the type and sole species,leave no doubt as regards its suitability to include the species of the section VERTICILLATAE sensu Benth. However,in consideration of the very brief description of the genus Eusteralis Rafin.,when published, the following emended description is furnished (see El-Gazzar &

L.Watson,1967:187): Leaves verticillate,3-10 in a whorl,linear,sess--ile and usually glabrous; calyx tubular,5-dentate; corolla subequally quadrifid;stamens 4,equal,exserted;filaments bearded; anthers terminal,unilocular and transversely dehiscent;helophytic herbs," with stems generally aerenchymatous and crystals usually present in the calyx.

This resuscitation of the genus Eusteralis Rafin. necessitates the transfer of seventeen species of Dysophylla,mainly from the Ind--ian region,to Eusteralis and of one species to the genus Pogostemon Desf. The nomenclatural check up has resulted in proposing a new name (nom.nov.) for Dysophylla stellata auctt.,non Benth.(1830) and which is named here as Eusteralis deccanensis as the species is endemic in South India.

1.**EUSTERALIS PUMILA** (Grah.) Rafinesque,Fl.Torull.2:95(1836/37).
Mentha(?) pumila Grah. in Edinb.New Phil.Journ.4:393(1828).
Type: Nepal," the seeds of this plant were obtained from Nepaul by Capt.Macgill..... sent to us in 1827.The seedlings were kept in the stove and never transplanted.... .Dec.Jan.",Graham s.n. (not seen).
Dysophylla crassicaulis var.pumila (Grah.)Hook.f.,Fl.Brit.Ind.4 :640(1885).

Clarke 23691 B collected from Madhya Pradesh,Raipur,Chumba,915 m, on 15 Oct.1874 and identified with D.crassicaulis Benth.var.amoena C.B.Clarke, represents a mere variant of E.pumila.
Distribution: India,Nepal.

2. EUSTERALIS STELLATA (Lour.) Panigrahi,comb.nov.
Mentha stellata Lour.,Fl.Cochin.2:361(1790),non Buch.-Ham.ex Roxb. (1832).Type: " Habitat loca humida inculta in Cochinchina",Loureiro s.n.(BM).Dysophylla verticillata Benth.[Wall.Cat.no.1544,1828, nom.nud.] in Wall.Pl.Asiat.Rar.1:30(1830),et Lab.Gen.et Sp.1:159 (1832-36);Hook.f.,Fl.Brit.Ind.4:639(1885). Type: Bangladesh.Sylhet, Wallich 1544.1(K-WALL.). Mentha verticillata Roxb.[Hort.Beng.:44 1814,nom.nud.],Fl.Ind.3:5(1832),non Linn.(1759),nec D.Don (1825). Type: East India,Roxburgh 159(K). Dysophylla stellata(Lour.)Benth.

in Wall.,Pl.Asiat.Rar.1:30(1830),pro parte,,incl.typo,excl.descript. et et synon.; Li Hsi-Wen in Aota Phytotax.Sin.13(1):75(1975),non Benth. (1832-'36). D.benthamiana Hance in Ann.Sci.Nat.V,Bot.5:234(1866); Merrill in Trans.Amer.Phil.Soc.New Ser.24(2):342(1935).Type: "In stagnis circa Cantonem,m.Aug.a.1864,Sampson (Herb.No.11448)(BM,K). D.ramosissima Benth.in Wall.Cat.No.1543,pro parte,1828, et Wall.,Pl. Asiat.Rar. 1:30(1830) in synon,nom.nud.

Distribution: China,Japan,Formosa,India,Nepal,Bangladesh,Sri Lanka, Thailand,Viet Nam,Java,Australia.

Bentham(1830) made,what we may now call a new combination,Dysophylla stellata(Lour.)Benth. based on Mentha stellata Lour.(1790) and identified Wallich 1542 (K-WALL) with it and described it.He also made,viewed as above, another new combination,D.verticillata (Roxb.) Benth. based on Mentha verticillata Roxb.(1814) and referred to it Wallich 1544 and furnished a description.Since Roxburgh's name was not validly published until 1832 and even then was a later homonym for Mentha verticillata L.(1759),D.verticillata Benth.must be considered as a (sp.nov.) dating from 1830 (see'Note' under Art.72 of the International Code of Botanical Nomenclature,1972). In 1832-36, however,Bentham realised that Mentha stellata Lour. was conspecific with D.verticillata Benth.(1830) but instead of adopting the earlier species epithet,he treated M.stellata Lour. as a synonym of D.verticillata Benth. and continued to adopt the name D.stellata Benth.(1830) for identifying specimens represented by Wallich 1542 from the South India. In this, he was wrong. I,therefore,propose here a new name Eusteralis deccanensis for the South Indian taxon in question.

Britten(1925) and Merrill(1935) recognised the conspecific nature of D.verticillata Benth. and Mentha stellata Lour., but instead of adopting D.stellata(Lour.)Benth. as the correct name for the taxon, Britten adopted D.verticillata Benth. and Merrill, D.benthamiana Hance.

3.EUSTERALIS DECCANENSIS Panigrahi,nom.nov.

Type: India.Kerala,Malabar,Wallich 1542(labelled Mentha malabarica Herb.Heyne) (K-WALL,holotype;K-isotype). Synon: Dysophylla stellata auctt., Benth. in Wall.Pl.Asiat.Rar.1:30(1830),pro parte,includo

descript.,excludo typum et synon; et Lab. Gen.et Sp.1:159(1832-36); Roxb.,Fl.Ind.3:5(1832); Grah.,Cat.Bomb.Pl.:150(1839);Lindley(?), Bot.Reg.t.23(1845);Benth.in DC.,Prodr.12:158(1848);Hook.f.,Fl.Brit. 4:640(1885);Gamble,Fl.Presid.Madras.2(6):1137(1924); non(Lour.)1790) Benth.(1830). Mentha stellata Buch.-Ham.ex Roxb.,Fl.Ind.3:5(1832); Dalzell & Gibson,,Bomb.Fl.:209(1861); Cooke,Fl.Presid.Bombay 2:540 (1903/1958,reprint),non Lour.(1790). Type: India.Mysore,Buchanan-Hamil. s.n.(BM). Mentha malabarica Heyne ex Benth.in Wall.Pl.Asiat.Rar.1:30 (1830),in synon,nom.nud.

Distribution: South India.

4. EUSTERALIS CRASSICAULIS (Benth.) Panigrahi,comb.nov.
Dysophylla crassicaulis Benth.,in Wall.,Pl.Asiat.Rar.1:30(1830), et Lab. Gen.et Sp.1:159(1832-36);Hook.f.,Fl.Brit.Ind.4:640(1885), pro parte, excl.var. Type: Bangladesh.Sylhet[Sillet],Wallich 1545 (K-WALL).

Distribution: India,Bangladesh & Burma.

5. EUSTERALIS LINEARIS (Benth.)Panigrahi,comb.nov.
Dysophylla linearis Benth.in DC.,Prodr.12:157(1848);Hook.f.,Fl.Brit. Ind.4:639(1885).Syntype: [selected here as lectotype]: India,Assam, Dom[a] Mack s.n. [Mrs.Mack] (K).

Distribution: China & India (Northern & Eastern).

6. EUSTERALIS GRACILIS (Dalz.) Panigrahi,comb.nov.
Dysophylla gracilis Dalz.in Hook.Journ.Bot.& Kew Gard.Misc.2:337 (1850);Hook.f.,Fl.Brit.Ind.4:641(1885). Type: "... in montibus Syhadree,prope Phonda Ghaut;fl.Oct."(not seen).

I have examined three sheets in the Kew Herb.(K): one labelled, "Dysophylla gracilis Mihi in Hook.,Dr.Ritchie 1988" in Dalzell's hand; 2nd sheet labelled"Dysophylla gracilis Dalz.in Hook.", and the 3rd sheet labelled," D.gracilis Dalz.in Hooker' hand and these must represent the type materials.

Distribution: India(Maharastra & Karnatak).

7. EUSTERALIS ERECTA(Dalz.) Panigrahi, comb.nov.
Dysophylla erecta Dalz.in Hook. Journ.Bot.& Kew Gard.Misc. 2:337(1850);Hook.f.,Fl.Brit.Ind.4:641(1885). Type:"In stagnorum marginibus Provinciae Malwan,fl.Sept."(not seen).

I have examined one sheet,from Dalzell's Bombay Herb. and labelled "D.erecta fide Dalzell" in Hooker's hand and this must be regarded as an authentic material.

Distribution: India(Maharastra).

8. EUSTERALIS TOMENTOSA (Dalz.) Panigrahi, comb.nov.
Dysophylla tomentosa Dalz. in Hook.Journ.Bot.& Kew Gard.Misc. 2:337(1850); Hook.f.,Fl.Brit.Ind.4:641(1885). Type: "in orgozotis Prov.Malwan,inter Deoghur et Viziadroog;fls.Dec." (not seen).

I have examined one sheet,labelled " Bombay,Dalzell" in Hooker's hand and"Dysophylla tomentosa"in Dalzell's hand(K) and this must be regarded as type material.

Distribution: India(Maharastra & Karnatak).

9. EUSTERALIS GRIFFITHII (Hook.f.) Panigrahi, comb.nov.
Dysophylla griffithii Hook.f.,Fl.Brit.Ind.4:641(1885).Type: India.Orissa: Sambalpur,Griffith [3968](K).

Distribution: India(Orissa).

10. EUSTERALIS HELFERI (Hook.f.) Panigrahi, comb.nov.
Dysophylla helferi Hook.f.,Fl.Brit.Ind.4:640(1885). Type: Burma.Tenasserim,East Pagoda,Helfer [3968].(K).

Distribution: Burma.

11. EUSTERALIS PEGUANA (Prain) Panigrahi, comb.nov.
Dysophylla peguana Prain in Journ.Asiat.Soc.Beng.59:299(1891).
Syntype:[selected here as lectotype],Burma,Pegu,[26.1.71],Kurz 2405(K).

Distribution: Burma.

12. EUSTERALIS PENTAGONA (C.B.Clarke ex Hook.f.) Panigrahi, comb.nov.
Dysophylla pentagona C.B.Clarke ex Hook.f.,Fl.Brit.Ind.4:641 (1885).Type: India.Bihar: ChotaNagpur,Singhboom[Bundgao],alt.

2000'[28 Oct.1873] Clarke [20438 A](K).

Distribution: India (Madhya Pradesh & Bihar).

13. EUSTERALIS CRUCIATA (Benth.) Panigrahi,comb.nov.
Dysophylla cruciata Benth.in Wall.,Pl.Asiat.Rar.1:30(1830); Hook.f.,Fl.Brit.Ind.4:639(1885). Type: Nepal,1821,Wallich 1541 (K- WALL).

Distribution: China , India, and Nepal.

14. EUSTERALIS STOCKSII(Hook.f.) Panigrahi,comb.nov.
Dysophylla stocksii Hook.f.,Fl.Brit.Ind.4:642(1885). Type: India. Maharastra,Concan,Stocks s.n.(K).

Distribution: India(Maharastra).

15. EUSTERALIS QUADRIFOLIA (Benth.) Panigrahi,comb.nov.
Dysophylla quadrifolia Benth.in Wall.Pl.Asiat.Rar.1:30(1830); Hook.f.,Fl.Brit.Ind.4:639(1885). Type: India,Roxburgh s.n. (labelled Mentha quadrifolia)(BM,K). D.velutina Benth.,l.c.:30 (1830) in synon,nom.nud.

Apart from the type I have also examined the specimens labelled "Toong,Wallich 1538 (labelled Dysophylla velutina Benth, and H.B.C.,1823,Wallich 1539(K,K-WALL) labelled Dysophylla quadrifolia Benth. and " Venkata Cotery,Dec.1800,labelled Mentha tetraphylla Roxb.(BM), which are identified here as E.quadrifolia.

Distribution: China,India,Bangladesh,Burma and Sri Lanka.

16.EUSTERALIS SAMPSONI (Hance)Panigrahi,comb.nov.
Dysophylla sampsoni Hance in Ann.Sc.Nat.Ser.V,Bot.5:234(1866). Type: " In udis circa Cantonem,1863[1864],Sampson (Herb.H.F. Hance,10946) (BM,K).

Distribution: China.

17. EUSTERALIS YATABEANA (Makino) Panigrahi,comb.nov.
Dysophylla yatabeana Makino in Bot.Mag.Tokyo 12:55(1898). Syntype:

[selected here as lectotype], Japan.Tokyo,Prov.Mushashi,Koiwa-Maru, cult.Herb.Sc.College,Imp.Univ.Tokyo,15 Sept.1883(K).

Distribution: Japan.

POGOSTEMON Desf.(1815)(Labiatae).

18. POGOSTEMON ANDERSONI (Prain) Panigrahi,comb.nov.

Dysophylla andersoni Prain in Journ.Asiat.Soc.Beng.59:298(1891).

Type: Sikkim,Tarai,9 Feb.1867,T.Anderson s.n.(K).

Distribution: India(Sikkim).

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A NEW SPECIES OF FUNIFERA (THYMELAEACEAE)

Lorin I. Nevling, Jr.
Field Museum of Natural History, Chicago, Illinois

At the time of my preliminary report on the genus *Funifera* (Jour. Arnold Arb. 46: 232-241. 1965) three species were recognized: *F. brasiliensis* (Raddi) Mansfeld; *F. ericiflora* (Gilg & Markgraf) Domke; *F. grandifolia* Domke. A fourth species was included in the key to species, was described as fully as possible, but was not named. It was assumed that additional material of the latter species would accumulate shortly and that it would be described fully at that time. A decade has passed and no new collections have been seen although an examination of a suite of specimens collected by Pereira (681) at the Jardim Botânico do Rio de Janeiro revealed the presence of both staminate and pistillate plants. Further delay in formally describing this new species does not seem warranted.

KEY TO THE SPECIES

Mature leaves 4 to 7 times longer than broad, narrowly elliptic to oblanceolate, 4-14 cm. long, 1-3 cm. broad, densely sericeous beneath.

> Leaves alternate or opposite, the apex long acuminate; staminate inflorescences 10-35-flowered, the primary peduncle 10-35 mm. long, slender; disc of the staminate flowers coronate, the lobes connate below; pistillate flowers with 4 staminodia. . . . . *F. insulae.*
> Leaves irregularly pseudo-whorled, opposite, subopposite or rarely alternate, the apex acute and often minutely apiculate; staminate inflorescences 5-6-flowered, the primary peduncle ca. 3 mm. long, stout; disc of the staminate flowers with 8 free lobes; pistillate flowers with 8 staminodia. *F. brasiliensis.*

Mature leaves about 3 times longer than broad, elliptic to oblanceolate or obovate, sparsely sericeous beneath.

> Leaves elliptic, 8-12 cm. long, 2.5-4 cm. broad, glabrous above, the apex subacute (nearly blunt); disc of the staminate flowers with 8 free lobes; pistillate flowers lacking staminodia. . . . . *F. ericiflora.*
> Leaves oblanceolate to obovate, 9-21 cm. long, 3-7 cm. broad, glabrescent above, the apex acute or abruptly acuminate; disc of the staminate flowers coronate, the lobes connate below; pistillate flowers with 8 staminodia. *F. grandifolia.*

FUNIFERA INSULAE Nevl. sp. nov.

Frutices; ramis juvenilibus subsericieis atque glabrescentibus. Folia alternata vel opposita anguste elliptica 5-12 cm. longa 1.5-3 cm. lata apice acuminata et apiculata basi cuneata supra glabra subtus sericeo-hirta. Inflorescentia mascula racemiformis. Flores masculi 10-35 in unaquaque inflorescentia; calyce cylindrico 6-7.5 mm. longo; calycis lobis inaequalibus intus pubescentibus; petalis 0; staminibus in planis 2; disco coroniformi 1.75-2 mm. longo glabro lobato; pistillodio fusiformi. Inflorescentia feminea umbelliformis. Flores feminei 3-6 in unaquaque inflorescentia; calyce cylindrico 6-8 mm. longo; calycis lobis inaequalibus intus pubescentibus; petalis 0; staminodiis 4 filiformibus; disco coroniformi 1-1.5 mm. longo glabro lobato; pistillo 1 ca. 5 mm. longo. Fructus non vidi. Holotypus: *Pereira 681* (F, no. 1746561).

Small shrub, the stems slender, sparsely sericeous and tardily glabrescent, reddish brown. Leaves alternate or opposite, the blades narrowly elliptic, 5-12 cm. long, 1.5-3 cm. broad, long acuminate and apiculate at the apex, cuneate at the base, membranaceous, glabrous (except sparsely sericeous along the margin) above, sericeous beneath, dark green above (light brown on drying), light green beneath (ochraceous on drying), the costa immersed above, elevated beneath, the primary lateral veins inconspicuous, the margin slightly thickened; petiole 2-5 mm. long, shallowly canaliculate, sericeous. Inflorescences borne from the older stems, axillary or extra-axillary. Staminate inflorescence: 10-35 flowers per inflorescence, racemiform, sericeous throughout, the primary peduncle 1-3.5 cm. long, the rachis 0.5-2 cm. long, the secondary peduncles 2-7 mm. long, dilated at the apex; linear bracteole inserted near the summit of the primary peduncle, deciduous. Staminate flowers: pedicel 1-1.5 mm. long; calyx tube cylindrical, 6-7.5 mm. long, ca. 1 mm. in diameter at the orifice, white, sericeous without, long villous within in lower one-fourth, glabrous upper three-fourths; calyx lobes in unequal pairs, linear-deltoid or deltoid, the larger 1 X 0.5 mm., the smaller 0.75 X 0.25-0.5 mm., puberulent within; petals 0; filaments 0.25-0.5 mm. long, the antisepalous whorl inserted about the length of 1 anther below the orifice, subexserted or included, the alternisepalous whorl inserted the length of 3-4 anthers below the orifice, included, the anthers linear, 0.75 mm. long, 0.25 mm. broad; disc coronate, 1.75-2 mm. tall, glabrous, with large linear lobes; pistillode fusiform, 2-3 mm. long, densely villous. Pistillate inflorescence: 3-6 flowers per inflorescence, umbelliform, sericeous throughout, the primary peduncle 10-18 mm. long, the rachis 0-2 mm. long, the secondary peduncles 2-6 mm. long, with several small, linear bracteoles at the summit of the primary peduncle, deciduous. Pistillate flowers: pedicel ca. 0.5 mm. long; calyx tube fusiform, 6-8 mm.

long, ca. 1 mm. in diameter at the orifice, white, sericeous without, long villous within in lower one-fourth, glabrous upper three-fourths; calyx lobes in unequal pairs, deltoid, the larger 1 X 0.5 mm., the smaller 0.5 X 0.5 mm., puberulent within; petals 0; staminodia 4, antisepalous, filiform, to 0.75 mm. long; disc coronate, 1-1.5 mm. tall, glabrous, irregularly lobed; pistil 1, the ovary ca. 2 mm. long, densely villous, the style filiform, ca. 3 mm. long, glabrous, the stigma capitate, at the calyx tube orifice. Immature fruit with accrescent calyx to 8 mm. long, ca. 4 mm. in diameter.

BRASIL. Rio de Janeiro: Ilha de Paquetá, Morro da Imbuca, *Pereira 681* 21-4-1952 (Isotypes: F, pistillate; RB, staminate and pistillate). Without precise locality: São Domingos, *Avé-Lellemant* "1887" (R).

NOTES ON NEW AND NOTEWORTHY PLANTS. LXXXV

Harold N. Moldenke

LIPPIA INSIGNIS Moldenke, sp. nov.

Frutex gracilis usque ad 3 m. altus; ramis ramulisque gracilibus dense puberulis senectute glabrescentibus; foliis numerosis decussato-oppositis; petiolis distinctissimis 3—7 mm. longis dense puberulis; laminis foliorum coriaceis erectis plerumque subappressis rotundato-ovatis vel subreniformibus vel subdeltoideis 1—2 cm. longis 1.5—2 cm. latis, ad apicem rotundatis vel emarginatis, ad basin truncatis vel cordato-subtruncatis, supra scaberrimis rugoso-subbullatisque, subtus densissime breviterque pubescentibus, margine crenatis in siccitate paullo revolutis; inflorescentiis axillaribus paucis capitato-spicatis longiter pedunculatis; bracteis anguste ellipticis 6—8 mm. longis ca. 2.5 mm. latis utrinque sparse pilosulis margine distincte regulariterque ciliolatis.

A spindly shrub, to 3 m. tall, branched; branches and branchlets quite slender, indistinctly tetragonal, densely and uniformly puberulent with very short spreading hairs when young, becoming glabrescent in age; internodes apparently uniformly much abbreviated, 0.5—2 cm. long; leaves decussate-opposite, numerous, almost overlapping because of the short internodes, apparently erect and more or less appressed to the branch; petioles very distinct and conspicuous, 3—7 mm. long, densely puberulent; leaf-blades coriaceous, beautifully round-ovate, subreniform, or subdeltoid, 1—2 cm. long, 1.5—2 cm. wide, mostly rounded (or emarginate) at the apex, truncate or cordate-subtruncate at the base, uniformly and regularly appressed-crenate along the margins (except at the base), very rough and rugose-subbullate above, very densely short-pubescent with erect hairs beneath, the margins somewhat revolute in drying; inflorescences few, axillary, usually one pair near the apex of each branch, ascending, to about 4 cm. long; peduncles solitary, slender, about 2.5 cm. long, sparsely and minutely puberulent; spikes subcapitate, 1—1.5 cm. long and wide, many-flowered; bractlets narrow-elliptic, 6—8 mm. long, about 2.5 mm. wide, sparsely pilosulous on both surfaces, the margins distinctly and regularly ciliolate; corolla hypocrateriform, mauve, white and yellow in the throat, the tube slender, slightly surpassing the subtending bractlet, puberulous outside, the limb 6—7 mm. wide.

The type of this most distinctive species was collected by R. M. Harley, S. A. Renvoize, C. M. Erskine, C. A. Brighton, and R. Pinheiro (Harley 17009) along a small stream with marsh on white sand and surrounding cerrado on sandstone rock exposures, at 950—1000 meters altitude, 16 km. northwest of Lagoinha (which is 5.5 km. southwest of Delfino) on the side road to Minas de Mimoso, in the Serra do Curral Feio, Bahia, Brazil, at approximately 41°20' W., 10°22' S., on March 8, 1974, and is deposited

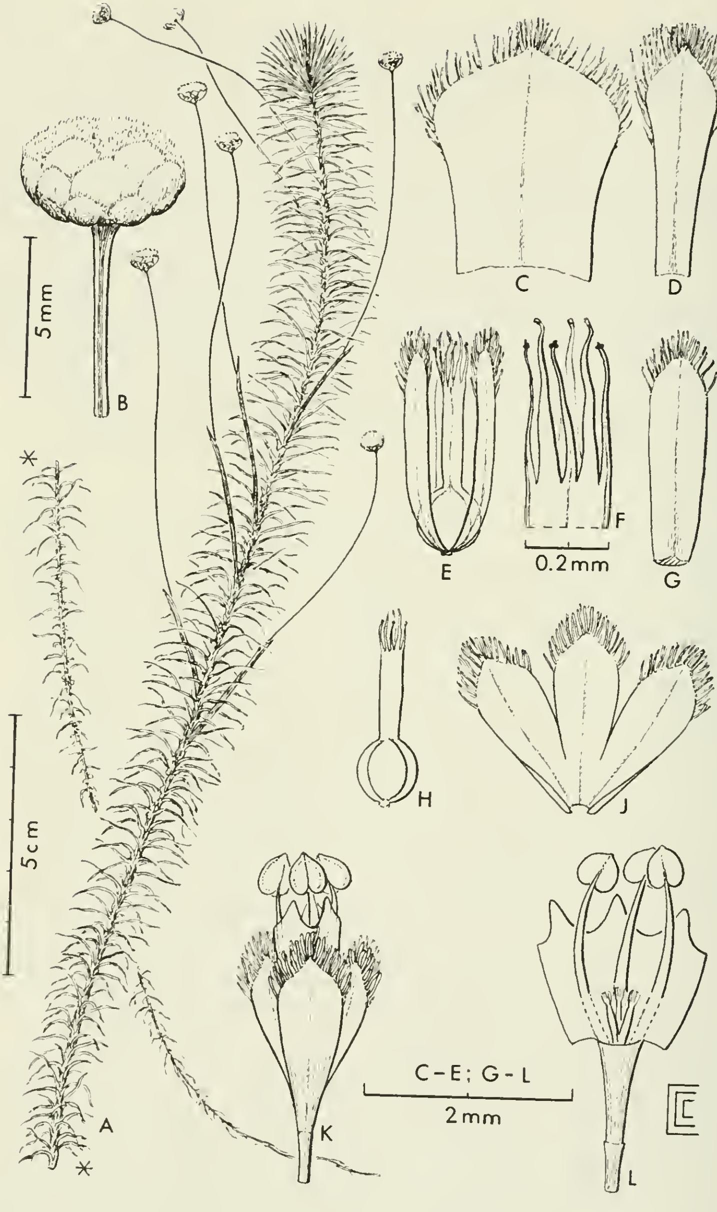

Fig. 1. Paepalanthus capillifolius

in the herbarium of the Royal Botanic Gardens at Kew, England.

PAEPALANTHUS CAPILLIFOLIUS Moldenke, sp. nov.

Herba aquatica vel subaquatica; caulis elongatis ad 57 cm. longis ubique densissime foliosis; foliis anguste linearibus vel filiformibus 10--15 mm. longis 0.06 mm. latis parcissime longiterque pilosis basin versus dense longiterque pilosis sessilibus margine integris apice mucronulatis; pedunculis 1--3 aggregatis secus caulem irregulariter dispersis filiformibus 2.5--9 cm. longis 3-costatis glabris; vaginis angustissimis 2--3 cm. longis sparse irregulariterque pilosis; capitulis hemisphaericis 5--6 mm. latis; bracteolis involucri obovato-oblongis atro-brunneis apicem versus extus pilosis.

Aquatic or semi-aquatic herb; stems elongate, flexible, to about 57 cm. long, unbranched, very densely and uniformly foliose except at the very base, more or less long-pilose at the leaf-bases, terete, brownish; nodes indistinct; internodes much abbreviated, mostly less than 5 mm. long; leaves very abundant, sessile, opposite, subopposite, scattered, or whorled (or the lowest even alternate), quite uniform in length, spreading at right angles to the stem, very narrowly linear or subfiliform, 10--15 mm. long, about 0.06 mm. wide, entire, mucronulate at the apex, very sparsely and irregularly long-pilose or glabrate except for the rather densely long-pilose base; peduncles scattered along the stems, solitary or in groups of 2 or 3, widely divergent, filiform, 2.5--9 cm. long, 3-costate, glabrous; sheaths very narrowly cylindric, closely appressed to the peduncle, 2--3 cm. long, sparsely and irregularly pilose; heads hemispheric, 5--6 mm. wide; involucral bractlets obovate-oblong or obovate-lingulate, dark-brown, pilose at and toward the apex on the back; for remaining floral details see the accompanying illustration drawn in November, 1975, by Charles C. Clare, Jr.: Fig. 1. A - Habit; B - Flower-head; C - Involucral bractlet; D - Receptacular bractlet; E - Pistillate floret; F - Pistillate floret showing style-branches and stigmas; G - Petal of pistillate floret; H - Gynoecium; J - Sepals of staminate floret; K - Staminate floret; L - Staminate floret, sepals removed, corolla-tube opened.

The type of this distinctive species was collected by G. Hatschbach, W. Anderson, R. Barneby, and B. Gates (no. 36456) in "Solo umido da borda de Capão (zona de campo), BR 259, km 10", in the Municipio Diamantina, Minas Gerais, Brazil, on February 24, 1975, and is deposited in my personal herbarium at Plainfield, New Jersey.

SYNGONANTHUS DECORUS Moldenke, sp. nov.

Herba parva annua; foliis basalibus caespitosis rosulatis numerosissimis parvissimis arcte recurvatis 3--5 mm. longis linearibus pilosulis; ramis solitariis erectis nigro-brunneis filiformibus 6--7 cm. longis teretibus nec tortis nec sulcatis glaberrimis; foliis ramorum angustissime linearibus vel filiformibus 5--10 mm. longis irregulariter glanduloso-pilosis rectis di-

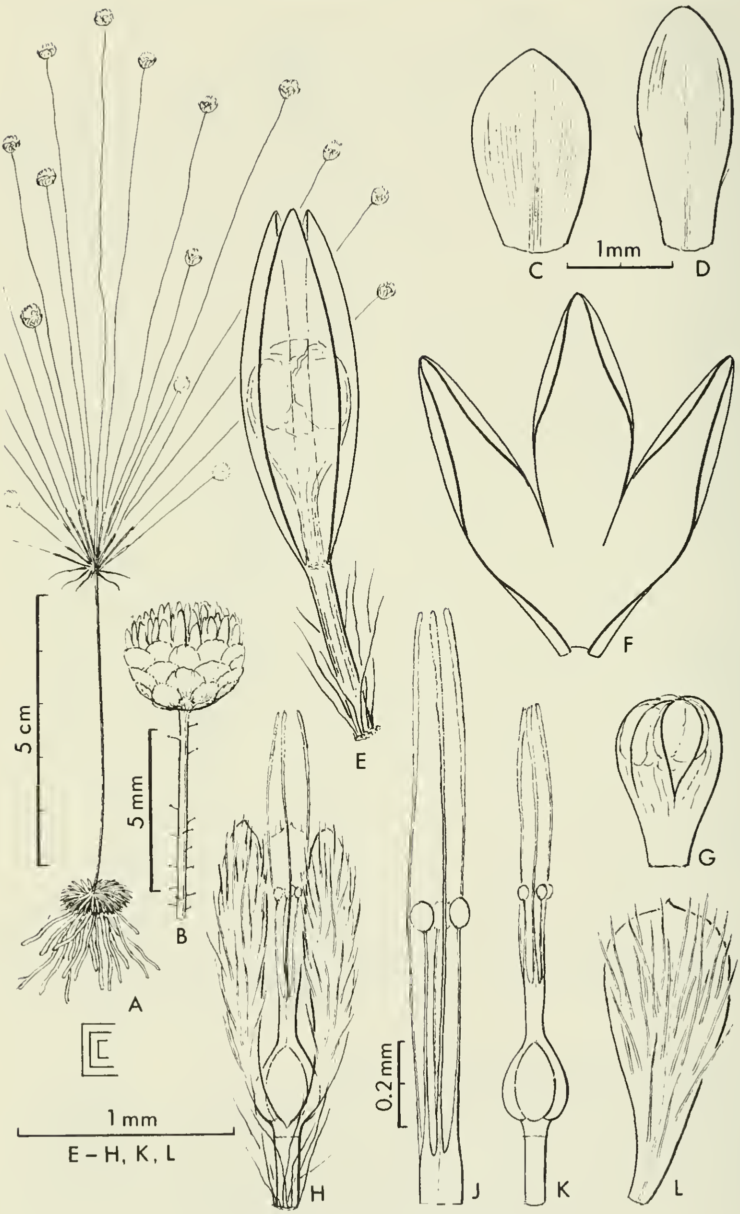

Fig. 2. Syngonanthus decorus

vergentibus; pedunculis numerosis umbellatis 5—13.5 cm. longis glabris flavidisque sed apicem versus sparse glanduloso-pilosis; vaginis anguste cylindricis 1—1.5 cm. longis densiuscule pilosis; capitulis hemisphaericis 5 mm. latis; bracteolis involucri stramineo-brunneis oblanceolatis glabris.

Small annual herb; basal leaves very numerous, cespitose, rosulate, very small, 3—5 mm. long, 0.5 mm. wide or less, linear, conspicuously recurved to the ground, pilosulous, acute; branches usually only 1 per plant, erect, brownish-black, filiform, 6—7 cm. long, terete, not twisted nor sulcate, glabrous, shiny; upper leaves terminating the branch, in a whorl of 16—20, unequal in length, 5—10 mm. long, narrowly linear or filiform, straight, rather stiff, divergent, irregularly glandular-pilose; peduncles in a terminal umbel of up to 25, erect or divergent-ascending, 5—13.5 cm. long, yellowish, glabrous except toward the apex where there are scattered capitate-glandular divergent hairs; sheaths narrowly cylindric, closely appressed to the peduncle, 1—1.5 cm. long, rather densely pilose, split at the apex, the blade lanceolate, erect, about 2 mm. long, pilose; heads hemispheric, about 5 mm. wide; involucral bractlets oblanceolate, brownish-stramineous, glabrous; for further floral details see the accompanying illustration drawn by Charles C. Clare, Jr., in November, 1975: Fig. 2. A - Habit; B - Flower-head; C - Involucral bractlet; D - Receptacular bractlet; E - Staminate floret; F - Sepals of staminate floret; G - Staminate floret with sepals removed; H - Pistillate floret; J - Pistillate floret, showing style-branches and stigmas; K - Gynoecium; L - Petal of pistillate floret.

The ttpe of this interesting species was collected by Gert Hatschbach (no. 36804) on a sandy campo at "Rod. GO-12, km 5-10 a Sul de Alto Paraiso", Goiás, Brazil, on May 24, 1975, and is deposited in my personal herbarium at Plainfield, New Jersey.

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ADDITIONAL NOTES ON THE ERIOCAULACEAE. LVIII

Harold N. Moldenke

ERIOCAULACEAE Lindl.

Additional bibliography: Körn. in Warm., Vidensk. Meddel. Nat. Foren. Kjöbenh. 23: [309]—315. 1871; Fedde in Just, Bot. Jahresber. 46 (2): 596, 624, 651, & 810. 1929; Moldenke, Phytologia 32: 458—470. 1975.

It should be noted here that Fedde (1929) refers to page "827" in his work as mentioning Eriocaulon, but I fail to find any reference to this genus, nor to the family, on this page.

ERIOCAULON Gron.

Additional bibliography: Schnitzl., Iconogr. 1: pl. 46, fig. 1—7. 1845; Fedde in Just, Bot. Jahresber. 46 (2): 596. 1929; Moldenke, Phytologia 32: 461--470. 1975.

Fedde (1929) asserts that there is a reference to this genus on page "827" of his cited work, but I fail to find it there.

ERIOCAULON DALZELLII Körn.

Additional bibliography: Woodr., Journ. Bomb. Nat. 13: 429. 1901; Cooke, Fl. Presid. Bombay, ed. 1, 2: 841 & 843 (1908), ed. 2, imp. 1, 3: 353 & 355 (1958), and ed. 2, imp. 2, 3: 353 & 355. 1967; Moldenke, Phytologia 29: 106, 197, & 283 (1974) and 32: 468. 1975.

Cooke (1908) cites only Dalzell s.n. and Stocks s.n. from Bombay, "in streams", flowering from October to December, and gives the overall distribution as "India (W. Peninsula)". He comments that "The specific name rivulare originally given to the plant by Dalzell (1851) was changed into Dalzellii by Koernicke (l.c.) on account of the name rivulare having been preoccupied by Don (1849). But Don's plant is now E. latifolium, Smith (1809), so that Dalzell's name has been restored." This action, however, is not in accord with the present edition of the International Code, so Körnicke's name is again being adopted by me.

The T. Koyama 13516, previously cited by me as E. dalzellii, seems better placed as E. ceylanicum Körn.

Additional citations: INDIA: Maharashtra: Vartak RD.19 (Z).

ERIOCAULON DECANGULARE L.

Additional synonymy: Randiala americana procerior Petiv. apud Lam., Encycl. Méth. Bot. 3: 276, in syn. 1789. Globulariae affinis aquatica, caule tenui aphyllo gramineo, capitulis albicantibus parvis globosis, foliis paucis humistratis gramineis Gron. apud Lam., Encycl. Méth. Bot. 3: 276, in syn. 1789. Eriocaulon culmo decangulari, foliis longis laevibus erectis Walt. apud Lam., Encycl. Méth. Bot. 3: 276, in syn. 1789. Eriocaulon noveboracense, capitulo alba globoso s. Globularia americana statices haud absimilis, cauliculis lana atro-rubente refertis Pluk. apud Lam., Encycl. Méth. Bot. 3: 276, in syn. 1789. Eriocaulon culmo striato longissimo, foliis ensiformibus brevibus prostratis, capitulo globoso Lam., Encycl. Méth. Bot. 3: 276. 1789.

Additional bibliography: Michx., Fl. Bor.-Am., ed. 1, imp. 1, 2: 165 (1803), ed. 2, 2: 165 (1820), and ed. 1, imp. 2, 2 [Ewan, Class. Bot. Am. 3]: 165. 1974; Moldenke, Phytologia 29: 283 (1974), 30: 57 (1975), and 31: 375 & 376. 1975; D. S. & H. B. Correll, Aquat. & Wetland Pl. SW. U. S., imp. 2, 1: [589] & 590, fig. 301 (1975) and imp. 2, 2: 1751. 1975; Duncan & Foote, Wildfls. SE. U. S. 240, [241], 286, & 287. 1975.

Additional illustrations: Duncan & Foote, Wildfls. SE. U. S. [241] (in color). 1975.

The illustration given by the Corrells (1975), purporting to represent the typical form of this species, seems, rather, to be of f. parviceps Moldenke.

It is worth mentioning here that the involucral bractlets on Moldenke & Moldenke 29949 are conspicuously long-pilose!

Lamarck (1789) calls this species "joncinelle décangulaire" and "joncinelle tardive".

Additional citations: NEW JERSEY: Burlington Co.: Moldenke & Moldenke 29139 (Mi, Sl, W). GEORGIA: Bulloch Co.: Moldenke & Moldenke 29949 (Gz). Jekyll Island: Moldenke & Moldenke 29883 (Gz). FLORIDA: Levy Co.: Moldenke & Moldenke 29458 (Ld, Tu). Nassau Co.: Moldenke & Moldenke 29866 (Ld).

ERIOCAULON DECANGULARE f. PARVICEPS Moldenke

Additional bibliography: Moldenke, Phytologia 29: 283. 1974; D. S. & H. B. Correll, Aquat. & Wetland Pl. SW. U. S., imp. 2, 1: [589], fig. 301. 1975.

Additional illustrations: D. S. & H. B. Correll, Aquat. & Wetland Pl. SW. U. S., imp. 2, 1: [589], fig. 301 [as E. decangulare]. 1975.

Additional citations: NICARAGUA: Cabo Gracias a Dios: Bunting & Licht 438 (W--2542882).

ERIOCAULON DEIGHTONII Meikle

Additional bibliography: Moldenke, Phytologia 26: 458. 1973; Heslop-Harrison, Ind. Kew. Suppl. 15: 51. 1974.

ERIOCAULON DEPRESSUM R. Br. ex J. E. Sm. in Rees, Cyclop. 13: Eriocaulon. 1809.

Additional bibliography: Moldenke, Phytologia 29: 194. 1974; Heslop-Harrison, Ind. Kew. Suppl. 15: 51. 1974.

ERIOCAULON DIANAE Fyson

Additional bibliography: Malhotra & Moorthy, Bull. Bot. Surv. India 13: 314. 1971; Moldenke, Phytologia 29: 194 & 236. 1974.

Malhotra & Moorthy (1971) cite their nos. 122480, 123257, & 123507.

The Vartak RD.8 & RD.11, distributed as typical E. dianae, seem better placed as var. longibracteatum Fyson, while RD.5 & RD.6 are better regarded as representing var. richardianum Fyson.

Additional citations: INDIA: Maharashtra: Vartak RD.4 (Z), RD.7 (Z), RD.9 (Ac), RD.10 (Z).

ERIOCAULON DIANAE var. LONGIBRACTEATUM Fyson

Additional bibliography: Moldenke, Phytologia 29: 194. 1974.

Additional citations: INDIA: Maharashtra: Vartak RD.8 (Ac), RD.11 (Ac).

ERIOCAULON DIANAE var. RICHARDIANUM Fyson

Additional bibliography: Moldenke, Phytologia 29: 194. 1974.

Material of this variety has been distributed in some herbaria as typical E. dianae Fyson.

Additional citations: INDIA: Maharashtra: Vartak RD.5 (Z), RD.6 (Z).

ERIOCAULON DIOECUM Ruhl.

Additional bibliography: León & Alain, Fl. Cuba, imp. 2, 1: 280 & 423. 1974; Moldenke, Phytologia 29: 283. 1974.

ERIOCAULON EBERHARDTII H. Lecomte

Additional bibliography: Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 136 & 204. 1949; Moldenke, Phytologia 26: 23. 1973.

ERIOCAULON ECHINOSPERMOIDEUM Ruhl.

Additional bibliography: Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 43 & 204. 1949; Moldenke, Phytologia 24: 358. 1972; León & Alain, Fl. Cuba, imp. 2, 1: 281 & 423. 1974.

ERIOCAULON ECHINOSPERMUM C. Wright

Additional bibliography: León & Alain, Fl. Cuba, imp. 2, 1: 279--280 & 423. 1974; Moldenke, Phytologia 29: 283 (1974) and 31: 397. 1975.

Ekman encountered this plant in mud at the edge of water of small lakes in pinelands, flowering in March, and fruiting in November. The United States National Herbarium specimen of what appears to be an isotype has its label "corrected" by someone to "3237" and to "3238", but obviously in error. The specimen on the sheet seems definitely to be part of Wright's no. 3738 collection.

Additional citations: CUBA: Pinar del Río: Ekman 18127 (W--1302883), 18767 (W--1302004); C. Wright 3738 (W--936259--isotype).

ERIOCAULON ECHINULATUM Mart.

Additional bibliography: Dunn & Tutcher, Kew Bull. Misc. Inf. Addit. Ser. 10: 291 & 292. 1912; Moldenke, Phytologia 29: 195. 1974.

ERIOCAULON EHRENBERGIANUM Klotzsch

Additional synonymy: Eriocaulon ehrenbergianum "Klotzsch ex Koern." apud Molina R., Ceiba 19: 24. 1975. Eriocaulon ehrenbergianum Körner ex Moldenke, Phytologia 31: 397, in syn. 1975.

Additional bibliography: Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 30, 35, & 204. 1949; Moldenke, Phytologia 24: 358 (1972), 31: 397 (1975), and 32: 465. 1975; Molina R., Ceiba 19: 24. 1975.

Recent collectors describe the flower-heads of this species as white and have found the plant growing "on open marsh plains", in springy bogs, and in the pine-oak zone at 1450 m. altitide, where

it was abundant in the sedge mats near streams, flowering in June, July, and November, and fruiting in June and July. Schaffner 226 is a mixture with E. microcephalum H.B.K.

Additional citations: MEXICO: Chihuahua: Townsend & Barber 117 (W--347044, W--568113). Federal District: F. Salazar s.n. [Xochimilco, Nov. 1912] (W--1014287). Hidalgo: Pringle 8989 (W--461460). Jalisco: Edw. Palmer 44 (W--45263, W--937154). México: Denton 1912 (Mi); Schaffner 226, in part (W--397194). GUATEMALA: Chimaltenango: Skutch 617 (W--1587618).

ERIOCAULON EKMANNII Ruhl.

Additional bibliography: Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 43 & 204. 1949; Moldenke, Phytologia 24: 358. 1972; León & Alain, Fl. Cuba, imp. 2, 1: 280--281 & 423. 1974.

ERIOCAULON ELENORAE Fyson

Additional bibliography: Moldenke, Phytologia 29: 196. 1974; Shah & Yogi, Journ. Bombay Nat. Hist. Soc. 71: 62. 1974.

Additional citations: INDIA: Maharashtra: Vartak RD.12 (Z).

ERIOCAULON ENSIFORME C. E. C. Fischer

Additional bibliography: Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 126 & 204. 1949; Vajravelu & Joseph, Bull. Bot. Surv. India 13: 271. 1971; Moldenke, Phytologia 26: 23--24. 1973.

Vajravelu & Jospeh (1971) describe this plant as a "Common herb in marshy places with long ensiform leaves, peduncles solitary, very long, heads ashy" and cite their no. 15562 from Coimbatore, India.

ERIOCAULON EPAPILLOSUM Ruhl.

Additional bibliography: Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 76 & 204. 1949; Moldenke, Phytologia 24: 458. 1972.

ERIOCAULON ESCAPE Hansen

Additional bibliography: Heslop-Harrison, Ind. Kew. Suppl. 15: 51. 1974; Moldenke, Phytologia 29: 196. 1974.

ERIOCAULON EURYPEPLON Körn.

Additional bibliography: Cooke, Fl. Presid. Bombay, ed. 1, 2: 851. 1908; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 126 & 204. 1949; Cooke, Fl. Presid. Bombay, ed. 2, imp. 1, 3: 363--364 (1958) and ed. 2, imp. 2, 3: 363--364. 1967; Moldenke, Phytologia 24: 459. 1972.

Cooke (1908) says "Koernicke gives 'East Indies' as the habitat of the plant which is stated to have been collected by Huegel no. 1886 (Hb. Vindob. et Zuccarini), no precise locality having been mentioned. Ruhland....gives East Indies, Malabar, Konkan, &c. as the habitat, and Stocks, Huegel, &c. as the collectors, but there is no mention of the whereabouts of the specimens said to have been collected by Stocks. None of these are to be found

in Herb. Kew., and as Stocks almost invariably sent his collections to the Kew Herbarium, I think it probable that Ruhland has made a mistake in his citation. There is, as far as I know, no evidence of the existence of the species in the Bombay Presidency." On the contrary, I have seen a specimen of Stocks, Law, &c. s.n. from "Malabar, Concan &c." in the Berlin herbarium and have one in my personal herbarium.

ERIOCAULON FABERI Ruhl.
Additional bibliography: Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 132 & 204. 1949; Moldenke, Phytologia 24: 459. 1972.

ERIOCAULON FISTULOSUM R. Br. ex J. E. Sm. in Rees, Cyclop. 13: Eriocaulon. 1809.
Additional bibliography: Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 153 & 204. 1949; Moldenke, Phytologia 24: 459. 1972; Heslop-Harrison, Ind. Kew. Suppl. 15: 51. 1974.

ERIOCAULON FLUVIATILE Trimen
Additional bibliography: Moldenke, Phytologia 29: 196—197 & 227 (1974) and 31: 390. 1975.
Hu describes what appears to be this species as a "very delicate herb" and encountered it in an abandoned ricefield, flowering and fruiting in August, and identified it as E. setaceum L. He also found it growing in "shade, on rock of a stream, flowers white", in anthesis in November. Vartak refers to it as growing in "liquid mud".
Additional citations: INDIA: Maharashtra: Vartak RD.14 (Z). SRI LANKA: Bogner 568 (Mu); Moldenke, Moldenke, Jayasuriya, & Sumithraarachchi 28279 (W--2765387), 28281 (W—2765385), 28292 (W--2765402). HONG KONG: S. Y. Hu 8529 (W—2675884), 10873 (W—2730973).

ERIOCAULON FRIESIORUM Bullock
Additional bibliography: Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 118 & 204. 1949; Moldenke, Phytologia 26: 24. 1973.

ERIOCAULON FULIGINOSUM C. Wright
Additional bibliography: León & Alain, Fl. Cuba, imp. 2, 1: 280 & 423. 1974; Moldenke, Phytologia 29: 283 (1974), 30: 35 (1975), and 31: 397 & 398. 1975.
Ekman found this species growing in moist places in pineland savannas. In addition to the months previously reported, it has been collected in anthesis in April and December and in fruit in April, September, October, and December. Material has been misidentified and distributed in some herbaria as E. schiedeanum Körn. On the other hand, the Britton, Britton, & Wilson 15008, distributed as E. fuliginosum, is actually E. pinarense Ruhl.

Additional citations: CUBA: Las Villas: Combs 588 (W--1515676). Oriente: Acuña 12379 (W--1880969). Pinar del Río: Ekman 17864 (W--1301997). BELIZE: Gentle 993 (W--1588375).

ERIOCAULON FULVUM N. E. Br.

Additional bibliography: H. Lecomte, Bull. Soc. Bot. France 55: 601. 1909; Moldenke, Phytologia 29: 197. 1974.

ERIOCAULON FUSIFORME Britton & Small

Additional bibliography: Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 45 & 204. 1949; Moldenke, Phytologia 24: 460. 1972; León & Alain, Fl. Cuba, imp. 2, 1: 280 & 423. 1974.

ERIOCAULON GAMBLEI C. E. C. Fischer

Additional bibliography: Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 126 & 204. 1949; Moldenke, Phytologia 26: 24. 1973; Mani, Ecol. & Biogeogr. India [Illies, Monog. Biolog. 23:] 187 & 741. 1974.

ERIOCAULON GIBBOSUM Körn.

Additional bibliography: Moldenke, Phytologia 29: 197 (1974) and 30: 37. 1975.

Malme (1901) cites Malme 1572 & 1572* from Mato Grosso, Brazil. His work is sometimes erroneously cited as "1903".

ERIOCAULON GLAUCUM W. Griff.

Additional bibliography: Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 129 & 204. 1949; Moldenke, Phytologia 24: 461. 1972.

ERIOCAULON GLAZIOVII Ruhl.

Additional bibliography: Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 76 & 204. 1949; Moldenke, Phytologia 24: 461. 1972.

ERIOCAULON GRAPHITINUM F. Muell. & Tate

Additional bibliography: Wangerin in Just, Bot. Jahresber. 46 (1): 402. 1925; Fedde in Just, Bot. Jahresber. 46 (2): 596. 1929; Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 153 & 204. 1949; Moldenke, Phytologia 24: 461. 1972.

ERIOCAULON GUADALAJARENSE Ruhl.

Additional bibliography: Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 30 & 204. 1949; Moldenke, Phytologia 26: 25. 1973.

Pringle found this plant growing in "wet places", flowering and fruiting in November.

Additional citations: MEXICO: Jalisco: Pringle 1734 (W—937153—isotype).

ERIOCAULON GUYANENSE Körn.

Additional bibliography: Moldenke, Known Geogr. Distrib. Ver-

benac., [ed. 2], 63, 66, 68, & 204. 1949; Moldenke, Phytologia 24: 461. 1972.

ERIOCAULON HAMILTONIANUM Mart.

Additional bibliography: Moldenke, Phytologia 29: 198--199. 1974.

The Vartak RD.30, distributed as E. hamiltonianum, seems actually to be E. humile Moldenke.

ERIOCAULON HANANOEGOENSE Masamune

Additional bibliography: Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 134 & 204. 1949; Moldenke, Phytologia 24: 462. 1972.

ERIOCAULON HELEOCHARIOIDES Satake

Additional bibliography: Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 134 & 204. 1949; Moldenke, Phytologia 24: 462. 1972.

ERIOCAULON HERZOGII Moldenke

Additional bibliography: Moldenke, Phytologia 26: 25. 1973; Heslop-Harrison, Ind. Kew. Suppl. 15: 51. 1974.

ERIOCAULON HETERODOXUM Moldenke

Additional bibliography: Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 66 & 204. 1949; Moldenke, Phytologia 24: 463. 1972.

ERIOCAULON HETEROGYNUM F. Muell.

Additional bibliography: Moldenke, Known Geogr. Distrib. Verbenac., [ed. 2], 153 & 204. 1949; Moldenke, Phytologia 24: 463. 1972.

ERIOCAULON HETEROLEPIS Steud.

Additional bibliography: Cooke, Fl. Presid. Bombay, ed. 1, 2: 851 (1908), ed. 2, imp. 1, 3: 363 (1958), and ed. 2, imp. 2, 3: 363. 1967; Moldenke, Phytologia 29: 199. 1974.

Cooke (1908) says "Plant collected by Polydore Roux near Bombay (fide Steudel). The species depends altogether on the description by Steudel, who may or may not have had Roux's specimens. Koernicke states....that he has seen no specimens of the plant and considers the species a very doubtful one which may have been described under another name, but, curiously enough, he has made a variety to this doubtful species in Miq. Ann. Mus. Lugd. Bat. v. 3 (1867) p. 239, which he names var. nigricans, a Java plant, which he fully describes. Ruhland....copies Koernicke's description of the Java plant (var. nigricans), and assigns it to E. heterolepis as a typical description of that species."

ERIOCAULON HETEROLEPIS var. NIGRICANS Körn.

Additional bibliography: Cooke, Fl. Presid. Bombay, ed. 1, 2:

851 (1908), ed. 2, imp. 1, 3: 363 (1958), and ed. 2, imp. 2, 3: 363. 1967; Moldenke, Phytologia 29: 199. 1974.

The Kuntze 5686, cited below, was previously erroneously cited by me as E. hookerianum Stapf. Kuntze encountered it at 5800 feet altitude, flowering and fruiting in August.

Additional citations: GREATER SUNDA ISLANDS: Java: Kuntze 5686 (N).

ERIOCAULON HETEROPEPLON Alv. Silv.

Additional bibliography: Fedde & Schust. in Just, Bot. Jahresber. 46 (2): 3. 1924; Moldenke, Phytologia 26: 25. 1973.

ERIOCAULON HETEROPETALUM Ruhl.

Additional bibliography: Moldenke, Phytologia 24: 463—464. 1972; León & Alain, Fl. Cuba, imp. 2, 1: 281 & 423. 1974.

ERIOCAULON HOOKERIANUM Stapf

Additional bibliography: Moldenke, Phytologia 29: 200 (1974) and 31: 389 & 390. 1975.

Andrew describes this plant as an "erect grasslike herb 15 cm. tall, the leaves and stems light-green, the flower-heads white".

The Kuntze 5686, cited by me as E. hookerianum in a previous installment of these notes, proves actually to be E. heterolepis var. nigricans Körn.

Additional citations: INDIA: Uttar Pradesh: Shivarajan 2 (Z). GREATER SUNDA ISLANDS: Papua: Andrew LAE.57132 (Mu).

ERIOCAULON HUMBOLDTII Kunth

Additional bibliography: J. A. Steyerm., Biotropica 6: 7 & 10. 1974; Moldenke, Phytologia 29: 200 (1974) and 30: 57. 1975.

Ruiz-Terán & López-Palacios describe this plant as an "Hierba morichalera, con rósula de 40--50 cm. de largo. Hojas de unos 40 cm. de largo. Escapos de 60--80 cm., cilíndricos, verde intensos [or] claros a verde amarillentos, lucientes, glabros, 1-céfalos. Capítulos terminales, subglobosos o hemisféricos, de ± 10 mm. de diámetro. Flores blancas a blanco grisáceas."

Additional citations: VENEZUELA: Bolívar: Ruiz-Terán & López-Palacios 11160 (Ld, Mi). BRAZIL: Roraima: Ruíz-Terán & López-Palacios 11056 (Tu).

ERIOCAULON HUMILE Moldenke

Additional bibliography: Moldenke, Phytologia 24: 465. 1972.

Material of this species has been misidentified and distributed in some herbaria as E. hamiltonianum Mart.

Additional citations: INDIA: Maharashtra: Vartak RD.16 (Ld), RD.30 (Ac).

ERIOCAULON INFIRMUM Steud.

Additional bibliography: Hartley, Dunstone, Fitzgerald, Johns, & Lamberton, Lloydia 36: 235. 1973; Farnsworth, Pharmacog. Titles 9 (1): x. 1974; Moldenke, Phytologia 29: 200 & 231 (1974)

and 31: 389. 1975.

The Santapau 9611 & 9630, previously cited by me as E. infirmum, seem better placed as E. quinquangulare L.

ERIOCAULON INFIRMUM var. PUBERULENTUM (Moldenke) Van Royen

Additional bibliography: Hartley, Dunstone, Fitzgerald, Johns, & Lamberton, Lloydia 36: 235. 1973; Moldenke, Phytologia 24: 466. 1972.

Hartley & his associates (1973) found this plant growing on open springy banks and cite their no. 10393 from New Guinea. Croft and his associates describe it as an erect herb, 10 cm. tall, the leaves semiglossy mid-green, and the flowers white, and encountered it in saturated swamp margins at 2100 m. altitude, flowering in December.

Additional citations: NEW GUINEA: Papua: Croft & al. LAE.60807 (Mu, W—2740755).

ERIOCAULON INSULARE Ruhl.

Additional bibliography: Moldenke, Phytologia 24: 466. 1972; León & Alain, Fl. Cuba, imp. 2, 1: 281 & 423. 1974.

ERIOCAULON INTRUSUM Meikle

Additional bibliography: Moldenke, Phytologia 26: 459. 1973; Heslop-Harrison, Ind. Kew. Suppl. 15: 51. 1974.

ERIOCAULON IRREGULARE Meikle

Additional bibliography: Moldenke, Phytologia 26: 459. 1973; Heslop-Harrison, Ind. Kew. Suppl. 15: 51. 1974.

ERIOCAULON JAUENSE Moldenke

Additional & emended bibliography: Anon., Ind. Bot. Guay. Highl. 8. 1972; Moldenke in Steyerm., Maguire, & al., Mem. N. Y. Bot. Gard. 23: 849—852, fig. 5. 1972; Moldenke, Phytologia 29: 201. 1974.

ERIOCAULON JOHNSTONII Ruhl.

Synonymy: Eriocaulou johnstoui Lorence, in herb.

Additional bibliography: Moldenke, Phytologia 29: 201 (1974) and 30: 339. 1975.

Lorence describes this plant as a semi-aquatic herb growing in gravelly beds of small streams, the roots and sometimes also the leaves submerged in the water, the leaves shiny-green, and the inflorescence waxy grayish-white. He refers to it as common in upland marshes and along streams, at 2000 feet altitude, in an area of 175 inches of rainfall per year. He found it in flower and fruit in December.

Additional citations: MASCARENE ISLANDS: Mauritius: Lorence M.33 (Mu, Z).

ERIOCAULON JORDANI (Moldenke) Meikle

Additional bibliography: Moldenke, Phytologia 26: 459. 1973;

Heslop-Harrison, Ind. Kew. Suppl. 15: 51. 1974.

ERIOCAULON KÖRNICKIANUM Van Heurck & Muell.-Arg.
Additional bibliography: Ayensu, Rep. Endang. & Threat. Pl. Spec. 56, 107, 143, & 151. 1974; Moldenke, Phytologia 29: 202. 1974; D. S. & H. B. Correll, Aquat. & Wetland Pl. SW. U. S., imp. 2, 1: 590 (1975) and imp. 2, 2: 1751. 1975.

ERIOCAULON LACUSTRE Ruhl.
Additional bibliography: Moldenke, Phytologia 24: 469. 1972; León & Alain, Fl. Cuba, imp. 2, 1: 281 & 423. 1974.

ERIOCAULON LANCEOLATUM Miq.
Additional bibliography: Woodr., Journ. Bomb. Nat. 13: 429. 1901; Cooke, Fl. Presid. Bombay, ed. 1, 2: 842 & 845 (1908), ed. 2, imp. 1, 3: 354 & 357 (1958), and ed. 2, imp. 2, 3: 354 & 357. 1967; Moldenke, Phytologia 29: 202. 1974.
Cooke (1908) cites only Stocks s.n. and Talbot 2947 from Bombay, India, where, he says, it is "Rare" and flowers in October and November. He gives its overall distribution as only "India (W. Peninsula)".

ERIOCAULON LATIFOLIUM J. E. Sm.
Additional & emended bibliography: Hook. f. & Benth. in Hook., Niger Fl. 547. 1849; Moldenke, Phytologia 29: 202. 1974.
The Dalziel 1112, distributed as E. latifolium, is actually Mesanthemum radicans (Benth.) Körn.

ERIOCAULON LEUCOMELAS Steud.
Additional synonymy: Eriocaulon horsley-konde var. megalocephala Fyson apud Kulkarni & Desai, Journ. Bombay Nat. Hist. Soc. 71: 84, sphalm. 1974.
Additional bibliography: Kulkarni & Desai, Journ. Bombay Nat. Hist. Soc. 71: 82—84. 1974; Moldenke, Phytologia 29: 202 (1974), 30: 77 & 78 (1975), and 31: 397. 1975; Shah, Biol. Abstr. 59: 6329. 1975.
Additional citations: INDIA: Madras: Bembower 536 (Mu).

ERIOCAULON LIGULATUM (Vell.) L. B. Sm.
Additional synonymy: Paepalanthus kunthii Körn. ex Moldenke, Phytologia 30: 258, in textu. 1975.
Additional bibliography: Moldenke, Phytologia 29: 203 & 206 (1974), 30: 81, 256, & 258 (1975), and 31: 404. 1975.
Emygdio and his associates describe the plant as having "flores verdosas", but the heads are really very immature on their specimen. Malme (1901) cites Mosén 767 from "in stagnis" in Minas Gerais, Brazil. His work is sometimes erroneously cited as published in "1903".
Additional citations: BRAZIL: Minas Gerais: Emygdio, Duarte, Becker, & Silva Santos 3678 (N).

ERIOCAULON LINEARE Small

Additional bibliography: Anon., Biol. Abstr. 58 (7): B.A.S.I.C. E.222. 1974; Moldenke, Biol. Abstr. 58: 3844. 1974; Moldenke, Phytologia 29: 283—284 & 287. 1974.

Additional citations: ALABAMA: Covington Co.: R. Kral 36821 (Mu).

ERIOCAULON LINEARIFOLIUM Körn.

Additional bibliography: Moldenke, Phytologia 29: 204. 1974.

Hatschbach has collected this plant in flower and fruit in July.

Additional citations: BRAZIL: Goiás: Hatschbach 34577 (Ld).

ERIOCAULON LONGICUSPE Hook. f.

Additional bibliography: Moldenke, Phytologia 29: 205. 1974.

The United States National Herbarium specimen of our Ceylonese collection of this plant exhibits very small basal leaves — they are only about 1 cm. long and 2 mm. wide and are recurved.

The Vartak RD.13, distributed as E. longicuspe, seems to be E. ritchieanum Ruhl. instead.

Additional & emended citations: SRI LANKA: Moldenke, Moldenke, Jayasuriya, & Sumithraarachchi 28301 (W—2765393); Sumithraarachchi & Waas DBS.300 (Z); L. C. Wheeler 12176 (Z)

ERIOCAULON LONGICUSPE var. ZEYLANICUM Moldenke, Phytologia 31: 26. 1975.

Bibliography: Moldenke, Phytologia 31: 26. 1975.

Citations: SRI LANKA: Jayasuriya 1520 (Z—type).

ERIOCAULON LUZULAEFOLIUM Mart.

Additional & emended bibliography: Woodr., Journ. Bomb. Nat. 13: 429. 1901; Cooke, Fl. Presid. Bombay, ed. 1, 2: 842 & 848. 1908; Dunn & Tutcher, Kew Bull. Misc. Inf. Addit. Ser. 10: 292. 1912; Cooke, Fl. Presid. Bombay, ed. 2, imp. 1, 3: 354 & 360. 1958; Prain, Bengal Fl., imp. 2, 2: 848, 849, & 985. 1963; Cooke, Fl. Presid. Bombay, ed. 2, imp. 2, 3: 354 & 360. 1967; Moldenke, Phytologia 29: 205—206 & 221. 1974.

Emended illustrations: Schnitzl., Iconogr. 1: pl. 46, fig. 2 & 5. 1845.

Cooke (1908) cites only Stocks s.n. from Bombay, India, and gives the overall distribution of the species as "Throughout India; Ceylon".

ERIOCAULON MAGNUM Abbiatti

Additional bibliography: Moldenke, Phytologia 29: 207 (1974) and 30: 256. 1975.

Additional citations: ARGENTINA: Corrientes: Krapovickas, Cristóbal, Schinini, Arbo, Quarín, & González 26268 (Ld).

ERIOCAULON MALAISSEI Moldenke

Additional bibliography: Heslop-Harrison, Ind. Kew. Suppl. 15:

51. 1974; Leith, Phenol. & Season. Model 439. 1974; Moldenke, Phytologia 29: 284. 1974.

ERIOCAULON MANFEËNSE Meikle
Additional bibliography: Moldenke, Phytologia 26: 460. 1973; Heslop-Harrison, Ind. Kew. Suppl. 15: 51. 1974.

ERIOCAULON MELANOCEPHALUM Kunth
Additional bibliography: León & Alain, Fl. Cuba, imp. 2, 1: 281 & 423. 1974; Moldenke, Biol. Abstr. 58: 3844. 1974; Moldenke, Phytologia 29: 284 (1974), 30: 35 (1975), and 31: 397. 1975.
Killip found this plant growing in a lagoon near sealevel, flowering and fruiting in October. He misidentified it as var. longipes Griseb. because the United States National Herbarium sheet of C. Wright 3240 was mis-labeled "3241", the type collection of the variety. The plant on the sheet is definitely the short-pedunculate form and therefore belongs to Wright's 3240 collection.
Additional citations: CUBA: Pinar del Río: Killip 32380 (W--1712989); C. Wright 3240 (W--46422).

ERIOCAULON MELANOCEPHALUM var. LONGIPES Griseb.
Synonymy: Eriocaulon melanocephalum var. longipes Moldenke, Biol. Abstr. 58: 3844, sphalm. 1974.
Additional bibliography: Moldenke, Biol. Abstr. 58: 3844. 1974; Moldenke, Phytologia 29: 284 (1974) and 31: 397. 1975.
It is very probable that this taxon should be reduced to form status, since it probably occurs only when the water level rises beyond the normal.
The Killip 32380, distributed as this variety, actually represents the typical E. melanocephalum Kunth.

ERIOCAULON MICROCEPHALUM H.B.K.
Additional bibliography: Soukup, Biota 2: 301. 1959; Moldenke, Phytologia 29: 208 (1974) and 30: 26, 31, 76, & 118. 1975.
Recent collectors have found this plant growing in springy places at altitudes of 2100--6650 meters, flowering and fruiting (in addition to months previously reported in these notes) in April. Cleef describes it as a "planta arrosetada" or "hierba pequeña, arrosetada, flores blancas" and encountered it in "vegetación paramuna muy húmeda....con Carex jamesonii, Valeriana cf. plantaginea, Alchemilla paludicola y Breutelia, asociados con rastrojo de Senecio reissianus", "pantano con Chusquea, Werneria articulata y Sphagnum spp.", "turbera....con rastrojo de Senecio flos-fragrans, asociado con Pleurozium schreberi", "turbera..... con muchos briófitos, Senecio flos-fragrans, Puya goudotiana, Geranium y Calamagrostis effusa", and "vertiente paramuno, poco húmedo con Calamagrostis effusus, Espeletia grandiflora, Hypericum sp. y briófitos".
Schaffner 226 is a mixture with E. ehrenbergianum Klotzsch.

The Standley & Valerio 43637 & 43830, Taylor & Taylor 11738, and Williams, Jiménez M., & Williams 24472, distributed as E. microcephalum, are actually Paepalanthus kupperi Suesseng.

Additional citations: MEXICO: Hidalgo: H. E. Moore Jr. 2800 (W--1945879), 3334 (W--1945933). México: Pringle 6144 (W--251782, W--937183), 7361 (W--1638161), 13228 (W--461824); Rose & Painter 7929 (W--451547); Schaffner 226, in part (W--397194). COLOMBIA: Cundinamarca: Cleef 3197 (Ut--316660), 4111 (Ut--316657), 5198 (Ld), 8311 (Ut--316642); Cleef & Jaramillo M. 3076 (Ut--316663).

ERIOCAULON MINIMUM Lam., Encycl. Méth. Bot. 3: 275. 1789.

Additional bibliography: Lam., Encycl. Méth. Bot. 3: 275. 1789; Moldenke, Phytologia 29: 208, 231, 235, & 236. 1974.

Lamarck (1789) describes this plant as "Eriocaulon culmis setaceis, foliis ensiformibus, capitulo minimo subgloboso". He continues: "An Eriocaulon sexangulare. Burm. Fl. Ind. t. 9. f. 4. Je ne trouve pas dans les angles des tiges, autant de ressource que Linné, pour distinguer les espèces de ce genre; en effet, dans presque toutes, les angles dont il s'agit sont peu élevés, & en outre separés par des cabbelures, de manière qu'il est difficile d'en bien distinguer le nombre.

"L'espèce dont je traite ici est fort petite, ne s'elève qu'à un pouce & demi de hauteur, & me paroît assez bien rendue dans la figure citée de M. Burman; mais je doute que ce soit Eriocaulon sexangulare de Linné, car il dit dans son Flora Zeylanica (p. 20. no. 49.), que les folioles de son calice commun sont orbiculées, ce qui n'est pas vrai pour cette espèce.

"Sa racine, qui est fibreuse, pousse des feuilles étroites, ensiformes, graminées, concaves en dessus, & à peine longues d'un pouce. Les tiges sont sétacées, n'ont qu'un pouce & demi ou rarement deux pouces de longueur, viennent en faisceau, & sont enveloppées chacune à leur base par une feuille coutre & vaginale. Lés têtes de fleurs sont fort petites, comme globuleuses, glabres, & ont un calice commun d'environ sept folioles oblongues, ovales & obtuses. Cette petite plante croît dans l'Indie, & m'a été communiquée par M. Sonnerat". He calls the plant, in French, "joncinelle naine".

Sumithraarachchi and his associates found this plant growing along roadside streams and at the edge of a waterfall and describe the flower-heads as gray or brownish and the plants 3--4 inches tall. The found it in flower and fruit in March and April.

Additional citations: SRI LANKA: Sumithraarachchi & Jayasuriya DBS.204 (Z), DBS.298 (Ld).

ERIOCAULON MINUTISSIMUM Ruhl.

Additional bibliography: Moldenke, Phytologia 24: 478. 1972; León & Alain, Fl. Cuba, imp. 2, 1: 280 & 423. 1974.

ERIOCAULON MINUTUM Hook. f.

Additional bibliography: Woodr., Journ. Bomb. Nat. 13: 429.

1901; Cooke, Fl. Presid. Bombay, ed. 1, 2: 842 & 846--847 (1908), ed. 2, imp. 1, 3: 354 & 359 (1958), and ed. 2, imp. 2, 3: 354 & 359. 1967; Moldenke, Phytologia 29: 208--209. 1974.

Cooke (1908) cites only Stocks s.n. from Bombay, India, where he says the species is "Rare" and gives the overall distribution as "India (W. Peninsula)".

The Vartak RD.16, distributed as E. minutum, appears actually to be E. humile Moldenke.

ERIOCAULON MISERRIMUM Ruhl.

Additional bibliography: Moldenke, Phytologia 24: 478--479. 1972; León & Alain, Fl. Cuba, imp. 2, 1: 280 & 423. 1974.

ERIOCAULON MISSIONUM Castell.

Additional bibliography: Moldenke, Phytologia 24: 479. 1972; Hocking, Excerpt. Bot. A.21: 211. 1973.

ERIOCAULON MODESTUM Kunth

Additional bibliography: Körn. in Warm., Vidensk. Meddel. Naturh. Foren. Kjöbenh. 23: 316. 1871; Moldenke, Phytologia 29: 209 & 289 (1974) and 30: 323. 1975.

Körnicke (1871) cites several unnumbered Warming specimens as follows: "In lacu Lagoa Santa, et in udis ripae et in lacu ipso abundans Febr., Aprili, Majo, Novembri (Wrmg.). In solo minus aquoso folia breviora, in aqua ipsa longiora fluitantia evadunt (Wrmg.)." He describes these new collections as "In specimine quodam perigonii masculi exterioris partes (semper vel cito?) ima basi excepta liberae. In flosculo masculo aliquo perigonii interioris partes 4, tria minora; stamina 7; octavum enim quarto petalo oppositum deest."

Malme (1901), whose work is sometimes erroneously cited as "1903", cites Malme 244 from Rio Grande do Sul and Mosén 1058 & 1059 from Minas Gerais, Brazil. He encountered the plant in swamps in association with Xyris macrocephala Vahl. Mosén found it "In ripa interdum inundatata".

ERIOCAULON MODESTUM var. BREVIFOLIUM Moldenke

Additional bibliography: Moldenke, Phytologia 29: 209. 1974.

In view of Warming's comments, quoted directly above, based on firsthand observation in the wild, it is probable that this taxon should be reduced to form status.

Additional citations: BRAZIL: Distrito Federal: Irwin, Souza, & Reis dos Santos 11677 (W--2759066). Goiás: Irwin, Grear, Souza, & Reis dos Santos 13498 (W--2759067).

ERIOCAULON MOLINAE L. O. Williams

Additional bibliography: Moldenke, Phytologia 25: 126. 1973; Heslop-Harrison, Ind. Kew. Suppl. 15: 51. 1974; Molina R., Ceiba 19: 24. 1975.

Additional citations: HONDURAS: Morazán: Williams & Correll 29289, in part (W--2566500).

ERIOCAULON MONTANUM Van Royen

Additional bibliography: Hartley, Dunstone, Fitzgerald, Johns, & Lamberton, Lloydia 36: 226 & 235. 1973; Farnsworth, Pharmacog. Titles 9 (1): x. 1974; Moldenke, Phytologia 29: 210. 1974.

Hartley and his associates (1973) found this plant "Forming cushions in secondary alpine meadows" and cite their no. 11259 from New Guinea. Croft and his associates describe it as a "cushion plant, leaves glossy mid-green, flowers white, fruit brownish" and encountered it in alpine grassland peat bogs, at 3300 m. altitude, flowering and fruiting in December.

Additional citations: NEW GUINEA: Papua: Croft & al. LAE.60671 (Mu, W—2740738).

ERIOCAULON NANUM R. Br.

Additional bibliography: Moldenke, Phytologia 24: 482. 1972.

Parker describes this plant as an herb to 4 cm. tall, growing in clumps, and found it in moist disturbed sand areas, flowering and fruiting in July.

Additional citations: AUSTRALIA: Northern Territory: M. Parker 134 (Ld).

ERIOCAULON NEGLECTUM Ruhl.

Additional bibliography: Moldenke, Phytologia 29: 211 (1974), 30: 37 (1975), and 31: 384. 1975.

ERIOCAULON NEPALENSE Prescott

Additional bibliography: Collett, Fl. Siml. 549 & 550. 1902; Moldenke, Phytologia 29: 211. 1974.

Collett (1902) gives the overall distribution of this species as "Kangra to Sikkim, 4000—6000 ft.", says that it blooms from August to October, and cites it from Khasia.

ERIOCAULON NILAGIRENSE Steud.

Additional bibliography: Shetty & Vivekanathan, Bull. Bot. Surv. India 13: 23 & 40. 1971; Moldenke, Phytologia 29: 284 (1974) and 31: 389. 1975.

Shetty & Vivekanathan (1971) refer to this plant as "common in marshy places in grassland", at 2575 meters altitude, flowering in November, and cite their no. 26528.

Additional citations: SRI LANKA: Moldenke, Moldenke, Jayasuriya, & Sumithraarachchi 28269 (W—2765417), 28270 (W—2765416), 28273, in part (W—2765376), 28274 (W--2765375).

ERIOCAULON NILAGIRENSE f. PARVIFOLIUM Moldenke

Additional bibliography: Moldenke, Phytologia 29: 212 (1974) and 31: 389. 1975.

Stone encountered this plant in "very moist grass-obscured rivulets in patanas in open patches of disturbed ericaceous forest", on the Horton Plains, at 2350 meters altitude, and comments that this is "a large species often embedded in dense mats of a small Panicum sp., occasionally in small open pools, the scapes

green, the flowers grayish-white". This is exactly in the habitat in which my wife and I found the plant in great abundance during our exploration of the Horton Plains. He collected it in flower in April.

Additional citations: INDIA: Uttar Pradesh: Shivarajan 1 (Ac). SRI LANKA: Moldenke, Moldenke, Jayasuriya, & Sumithraarachchi 28275 (W--2765374), 28276 (W--2765373--isotype), 28278 (W--2765388), 28286 (W--2765381), 28298 (W--2765396), 28300 (W--2765394), 28302 (W--2765389); B. C. Stone 11278 (W--2766570).

ERIOCAULON NOVOGUINEENSE Van Royen

Additional bibliography: Moldenke, Phytologia 24: 484. 1972; Hartley, Dunstone, Fitzgerald, Johns, & Lamberton, Lloydia 36: 235. 1973; Farnsworth, Pharmacog. Titles 9 (1): x. 1974.

Hartley and his associates (1973) found this plant "Forming cushions in secondary alpine meadows" and cite their no. 12998 from New Guinea.

ERIOCAULON ODORATUM Dalz.

Additional bibliography: Woodr., Journ. Bomb. Nat. 13: 429. 1901; Cooke, Fl. Presid. Bombay, ed. 1, 2: 842 & 844 (1908), ed. 2, imp. 1, 3: 353 & 355--356 (1958), and ed. 2, imp. 2, 3: 353 & 355--356. 1967; Moldenke, Phytologia 29: 213 & 238. 1974.

Cooke (1908) cites Dalzell s.n., Stock s.n., Talbot 1837, 2948, & 2949, and Woodrow s.n. from Bombay, where, he says, it flowers in September. He gives its overall distribution as "India (W. Peninsula)" and comments that "The plant is described by Dalzell as smelling strongly of chamomile."

ERIOCAULON OLIVACEUM Moldenke

Additional bibliography: Moldenke, Phytologia 24: 485. 1972; León & Alain, Fl. Cuba, imp. 2, 1: 280 & 423. 1974.

ERIOCAULON OLIVERI Fyson

Additional bibliography: Moldenke, Phytologia 24: 485 (1972) and 31: 389. 1975.

Additional citations: INDIA: Uttar Pradesh: Shivarajan 3 (Z).

ERIOCAULON OREADUM Van Royen

Additional bibliography: Moldenke, Phytologia 24: 485. 1972; Hocking, Excerpt. Bot. A.21: 211. 1973.

Henty describes this plant as an herb, 8 cm. tall, with brownish heads, and found it growing on low mounds in savannas with Melaleuca, flowering in June.

Citations: NEW GUINEA: Papua: Henty NGF.49668 (Mu, Z).

ERIOCAULON ORYZETORUM Mart.

Additional & emended bibliography: Collett, Fl. Siml. 549 & 550. 1902; Prain, Bengal Pl., imp. 2, 2: 848 & 985. 1963; Moldenke, Phytologia 29: 213. 1974.

Collett (1902) gives the overall distribution of this species

as "Garhwal to Sikkim, below 6000 feet" and the time of flowering as August to October.

ERIOCAULON OVOIDEUM Britton & Small
Synonymy: Eriocaulon evoideum Britton & Small ex Alain, Contrib. Ocas. Mus. Hist. Nat. Coleg. La Salle 7: 47, sphalm. 1946.
Additional bibliography: León & Alain, Fl. Cuba, imp. 2, 1: 280 & 423. 1974; Moldenke, Phytologia 29: 213. 1974.
Recent collectors have encountered this plant in white siliceous sand on white sand savannas, flowering and fruiting in February and April. Killip 44059 is a mixture with E. sclerocephalum Ruhl.
Additional citations: CUBA: Oriente: León & Seifritz 17496 (W-1784920). ISLA DE PINOS: Killip 44059, in part (W--2176133).

ERIOCAULON PALMERI Ruhl.
Additional bibliography: Moldenke, Phytologia 24: 487. 1972.
Additional citations: MEXICO: Durango: Edw. Palmer 172 (W--1689154--isotype).

ERIOCAULON PANAMENSE Moldenke
Additional citations: Moldenke, Phytologia 24: 487. 1972.
Recent collectors have encountered this plant on plateaus and in marshes, at altitudes of 1000--1500 meters, flowering in February and May, and fruiting in February. They describe it as 3--6 inches tall, the flowers white.
Additional citations: PANAMA: Chiriquí: Cornman 2678 (W--1823466); Davidson 657 (W--1766806).

ERIOCAULON PANCHERI H. Lecomte ex Guillaum. & Beauvis., Ann. Soc. Bot. Lyon 38: 114. 1914.
Additional bibliography: Guillaum. & Beauvis., Ann. Soc. Bot. Lyon 38: 114. 1914; Guillaum. & Beauvis., Sp. Montrouz. 40. 1914; Moldenke, Phytologia 24: 487. 1972; Heslop-Harrison, Ind. Kew. Suppl. 15: 51. 1974.

ERIOCAULON PARAGUAYENSE Körn.
Additional bibliography: Moldenke, Phytologia 29: 213. 1974.
Malme (1901), whose work is sometimes erroneously cited as "1903", cites Malme 1456b from "Loco aperto, uliginoso, graminoso" in Mato Grosso, Brazil.

ERIOCAULON PARKERI B. L. Robinson
Additional bibliography: Moldenke, Biol. Abstr. 58: 3844. 1974; Moldenke, Phytologia 29: 213--214 & 216. 1974.

ERIOCAULON PELLUCIDUM Michx.
Additional bibliography: Michx., Fl. Bor.-Am., ed. 1, imp. 1, 2: 166 (1803) and ed. 2, 2: 166. 1820; A. St.-Hil., Voy. Distr. Diam. 1: 393. 1833; A. St.-Hil., Linnaea 16: Litt. 188. 1842; Paine, Ann. Rep. Univ. N. Y. 18: [Pl. Oneida Co.] 146. 1865;

Rand & Redfield, Fl. Mt. Desert 162. 1894; Collett, Fl. Siml. 549. 1902; Gibbs, Chemotax. Flow. Pl. 3: 1883. 1974; Michx., Fl. Bor.-Am., ed. 1, imp. 2, 2 [Ewan, Class. Bot. Am. 3]: 166. 1974; Moldenke, Biol. Abstr. 58: 3844. 1974; Moldenke, Phytologia 29: 284 (1974) and 31: 376, 1975; D. S. & H. B. Correll, Aquat. & Wetland Pl. SW. U. S., imp. 2, 1: 592 (1975) and imp. 2, 2: 1751. 1975.

Gibbs (1974) reports tannin present in what he calls E. septangulare, but cyanogenesis, leucoanthocyanin, and mucilage absent. Whether he is referring here to E. pellucidum or to E. aquaticum (J. Hill) Druce is not clear, but presumably it is to this commoner of the two species.

Additional citations: NEW JERSEY: Ocean Co.: Moldenke & Moldenke 28550 (E, Gz, Mi, Sl, W, Ws).

ERIOCAULON PERUVIANUM Ruhl.

Additional bibliography: Soukup, Biota 2: 301. 1959; Moldenke, Phytologia 24: 491. 1972.

ERIOCAULON PINARENSE Ruhl.

Additional bibliography: Moldenke, Phytologia 24: 492. 1972; León & Alain, Fl. Cuba, imp. 2, 1: 281 & 423. 1974.

Material of this species has been misidentified and distributed in some herbaria under the name, E. scirpoides Griseb.

Additional citations: ISLA DE PINOS: Britton, Britton, & Wilson 15008 (W—793245, W—1049199).

ERIOCAULON PRINGLEI S. Wats.

Additional bibliography: Moldenke, Phytologia 24: 493. 1972.

Pringle found this plant growing in wet places on plains, flowering in October.

Additional citations: MEXICO: Chihuahua: Pringle 2018 (W—45284—isotype, W—937184—isotype).

ERIOCAULON PSEUDOCOMPRESSUM Ruhl.

Additional bibliography: León & Alain, Fl. Cuba, imp. 2, 1: 280 & 423. 1974; Moldenke, Phytologia 29: 284. 1974.

This plant has been encountered in the Eleocharis belt around lagoons near sealevel, flowering and fruiting in December. The Marie-Victorin 58316, distributed as E. pseudocompressum, actually is Paepalanthus pungens var. brevifolius Moldenke,

Additional citations: CUBA: Pinar del Río: Ekman 11221 (W—1301977); Killip 32372 (W—1712982).

ERIOCAULON PYGMAEUM Soland.

Additional bibliography: Heslop-Harrison, Ind. Kew. Suppl. 15: 52. 1974; Moldenke, Phytologia 29: 220 (1974) and 32: 468. 1975.

Latz describes this plant as an "erect ephemeral with whitish heads, locally common in damp sand in bed of river near waterhole" and found it in flower and fruit in February. He comments that "ex description, some male sepals are united". In habit it strongly reminds one of the dwarf forms of E. cinereum R. Br. as

well as E. humile Moldenke of India.

Additional citations: AUSTRALIA: Northern Territory: Latz 2203 [Herb. North. Terr. 34447] (Z), 2227 (Ld).

"ERIOCAULON QUINQUANGULARE" Bojer, Hort. Maurit. 361. 1837.

Bibliography: Bojer, Hort. Maurit. 361. 1837; Jacks. in Hook. f., Ind. Kew., imp. 1, 1: 879 (1893), imp. 2, 1: 879 (1946), and imp. 3, 1: 879. 1960; Punt, Reg. Vegat. 36: 9. 1964; Moldenke, Phytologia 18: 429 & 433. 1969; Anon., Taxon 24: 173. 1975.

Jackson (1893) avers that this binomial belongs in the synonymy of Paepalanthus repens (Lam.) Körn., a species native to Hispaniola and erroneously attributed to Mauritius by Lamarck and most subsequent authors.

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